

AMERICAN ARTISAN

APRIL
1940



RESIDENTIAL AIR CONDITIONING
WARM AIR HEATING • SHEET METAL CONTRACTING

ESTABLISHED
1880

LAMNECK

Series 700 System

PREFABRICATED DUCT
AND FITTINGS

PREDETERMINED ENGINEERING

*Is the Reason why LAMNECK
INSTALLATIONS are more Efficient
... Pay You Biggest Profits!*

Predetermined Engineering is not new. You use it and depend upon it every day. For instance, when you figure a job, you choose a heating or cooling unit of known and rated capacity. The unit has been "Pre-Engineered" . . . and you'd dare not recommend nor install one not guaranteed by such known knowledge. Why then handicap this guaranteed unit of known capacity by a duct installation not Pre-Engineered?

Lamneck ductwork gives you positive assurance of this capacity — efficiency — dependability — ease of assembly and installation. It guarantees, to both you and your customer, a perfectly balanced complete installation, delivering the rated capacity of the unit.

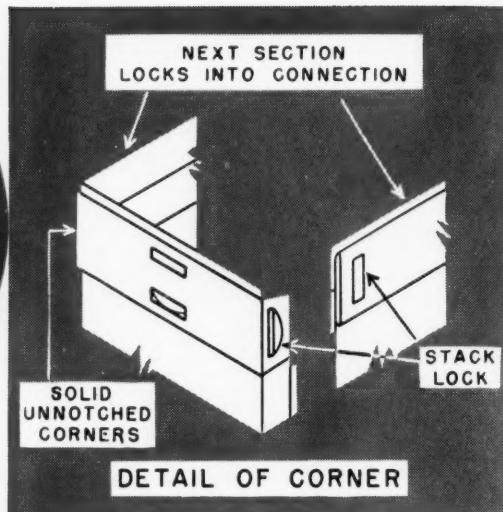
Looked at from this viewpoint, your own shrewd business head will tell you to investigate the Lamneck Method. In addition, it returns cash savings in material cost—labor cost—and the time it takes YOU to figure a job. It all adds up to a total that *gets you the job PLUS A BIGGER PROFIT!*

WRITE FOR NAME OF YOUR
NEAREST DISTRIBUTOR

Specify
LAMNECK

LAMNECK PRODUCTS, Inc.

416-436 Dublin Ave., Columbus, Ohio



LAMNECK

Stack and Stack Connector
Saves You Time and Money

LAMNECK STACK

Each joint includes connector. Shipped knocked down and nested. Assembled in 30 seconds. No seams to hammer down. No seams at edges. All double metal in the "Flat." Length cut easily. Additional connectors utilize waste pieces.

LAMNECK STACK CONNECTORS

Available separately. Easily and inexpensively applied to your own stack. Forms a butt-type joint. Solid-unnotched corners. No large and small end. Stack makes up full length. Entire joint wrapped with metal. No screws used or needed. Greatest possible free area inside duct and with no disturbance of air-flow.

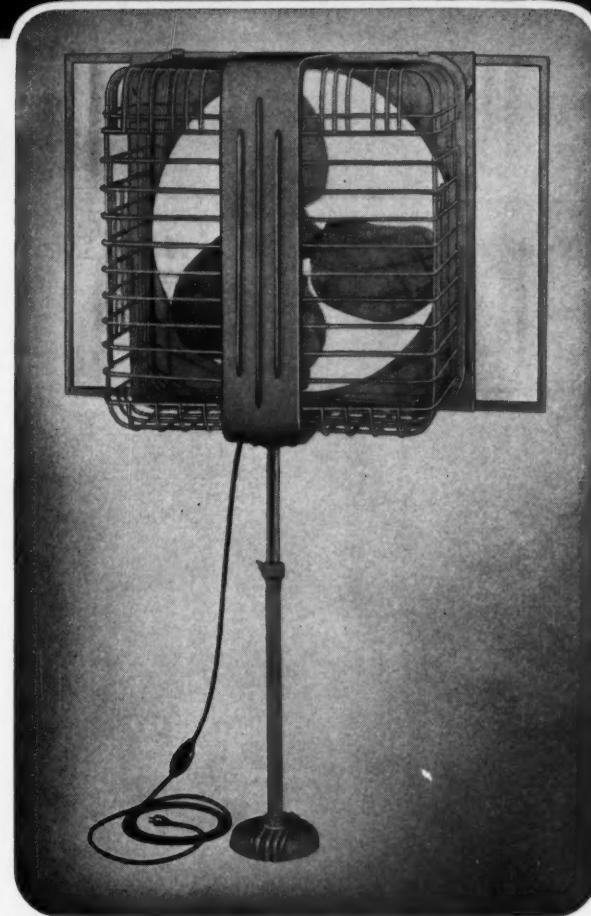
These are a few of the many labor-saving advantages to your using Lamneck's Revolutionary Prefabricated Duct and Fittings. Write now for complete details.



Prefabricated Duct and Fittings for
All Types of Residential Warm Air
Heating and Air Conditioning Systems

V
AME

VIKING WINDOW FAN



*for
Residential
Comfort Cooling*

- EASY to SELL
- EASY to INSTALL

Installed in 15 minutes

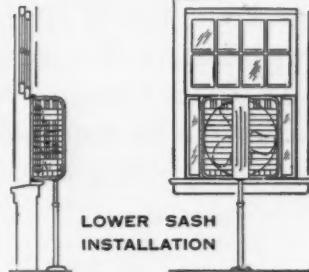
Sketches show simplicity of installation
in upper and lower sash of any window

One glance at these illustrations will show why the Viking Window Fan is so easy to sell and install . . . Portable, it appeals equally to tenant and home-owner . . . Adaptable to upper or lower sash installations without interfering with opening or closing of window . . . Open construction and translucent spacer panels, adjustable to any width window, allow passage of light . . . Modern design with ivory and chrome finish harmonizes with any decorative scheme . . . Quiet, slow speed fan gives maximum air delivery with minimum power . . . Low price (under \$50 including fittings) places it in the reach of every family.

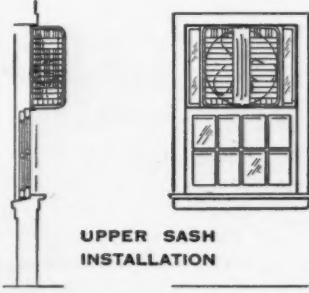
Write today for complete information.

VIKING AIR CONDITIONING CORP.

9500 Richmond Avenue Cleveland, Ohio
FANS • BLOWERS • HUMIDIFIERS



LOWER SASH
INSTALLATION



UPPER SASH
INSTALLATION

VIKING AIR CONDITIONING CORPORATION

AMERICAN ARTISAN

Covering All Activities in Residential Air Conditioning and Small Commercial Cooling, Warm Air Heating, Sheet Metal Contracting and Fabricating

WITH WHICH ARE MERGED

FURNACES
SHEET METALS

AND

Warm-Air
Heating

J. D. Wilder, Editor

A. A. Kennedy, Assistant Editor

Vol. 109, No. 4

April, 1940

Founded 1880

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In This Issue

Typical of the season's activity in most parts of the country is this month's cover picture, showing homes under construction. Reports indicate a volume of heating work being figured and an increased volume of small home construction under way or planned.

In the December, 1939 issue we published an article claiming high side wall registers were charged with danger. A rebuttal (Buck) appeared in the March issue. On page 41 another reader takes exception to the December article and offers some excellent arguments.

Reducing the fabrication of duct costs is a timely problem, especially in view of the drive to build small homes allowing only 5 to 6 per cent for the heating system. On page 44 a reader tells how his shop cuts duct labor costs 80 per cent. We welcome other similar ideas.

Two articles (page 54 and 57) deal with the problem of balancing the system to obtain uniform temperatures throughout the house and "set" the equipment for maximum efficiency. The suggestions presented by both authors are not arm chair ideas, but very practical methods developed in the field.

The stainless steel dome at Baylor University (page 63) illustrates several ideas for handling this type of work when there is not enough material used to require special machine setups.

And a carefully worked out method for fabricating and erecting 14-gauge ducts of large size is explained on page 66. Careful preliminary survey of conditions saved money in the erection.

For those doing material collection and fume removal, the article on page 70 should prove a concise analysis of the fundamental factors and a warning against improper practices.

Member of Audit Bureau of Circulations — Member Associated Business Papers, Inc.

Published monthly by Keeney Publishing Company, 6 North Michigan Ave., Chicago, Ill., U. S. A. Branch Offices—In New York, Room 1734, Grand Central Terminal Building, Murray Hill 9-8293; In Cleveland, 2128 Rossmoor Road, Cleveland Heights, Yellowstone 1540; In Los Angeles, J. H. Tinkham, 1406 S. Grand Ave., Richmond 6191. Copyright 1940 by Keeney Publishing Company—F. P. Keeney, President; W. J. Osborn, Vice President; R. Payne Wettstein, Secretary; Chas. E. Price, Treasurer. Advertising staff: Wallace J. Osborn, R. Payne Wettstein, Robert A. Jack, J. H. Tinkham, L. A. Doyle.

Yearly Subscription Price—U. S. and possessions, Canada, Mexico, South America, Central America, \$2.00; Foreign, \$4.00. Single copies, U. S. and possessions, \$.25. Back numbers, \$.50. January, 1940, Directory issue, \$1.00 per copy. Entered as second-class matter, July 29, 1932, at the post office at Chicago, Illinois, under the act of March 3, 1879.

More than 8,000 copies of this issue are being distributed

The Doughboy an' the Door-knob



By
TIM SHEARS

I'm tinnin' my favorite soldering iron one morning when in walks the boss. "Tim," he says, "seems to me like you've given your contractor friends quite a bit of dope on big area roofing. How about tellin' 'em somethin' about using Monel for the little jobs? *They're* important, too."

Sein' I don't jump at the idea pronto, he asks me if I heard about the doughboy an' the door-knob. I haven't so he tells me.

"There's a bunch of doughboys showin' off their trophies," he starts, "an' they're tellin' tall stories about their adventures. Suddenly one of 'em looks at a little guy who hadn't said a word. 'Well, Shortie,' he kids, 'what did *you* bring back?' The little guy starts rummagin' around in his knapsack. Finally he pulls out a battered looking door-knob. The other guys give him the horse laugh, an' ask him what the heck *that's* supposed to be. 'Well,' he comes back, kind of quiet, *'sometimes the little things amount to more than the big ones.'* Take this door-knob, for instance. Out on patrol one night I'm detailed to take a squint at an old farmhouse. I creep through the bushes to a door at the side. I just get hold of the knob when

. . . zowie!!! A shell blows the farmhouse clean out of my hand . . . an' all I have left is the door-knob!"

I agree with the boss that little parts are sometimes big news . . . especially when there's a story back of 'em. There's quite a story back of cappings, flashings, gutters, skylight frames an' such . . . when you make 'em out of Monel . . . an' I don't mind tellin' it to you:

For one thing, parts like these need to be *plenty strong an' tough* . . . as well as *rust proof*. Even if a gutter don't *rust* . . . what good is it if it *wears out or breaks?* The same goes for cappings an'

all the rest of it. But use Monel, an' you do a real job. Monel is stronger an' tougher than the steel used for skyscraper frames; it can't rust, and it's easy as pie to fabricate an' weld.

In case you want to see how to set up different kinds of roofing joints in Monel, take a look at the table an' sketches below. An' if there's any questions just drop me a line. If I can't answer 'em, I'll find somebody that can.

Yours for Big Profits
from Little Parts,
TIM SHEARS.



Approx. Wt. per Square (100 sq. ft.)		
Type of Roofing	Monel .021" (No. 25 U.S.S.)	Monel .025" (No. 24 U.S.S.)
Flat Seam	120 lb.	150 lb.
Standing Seam	115 lb.	140 lb.
Batten Seam	*125 lb.	*156 lb.
Wt. per sq. ft. Monel Sheets	1 lb.	1.16 lb.

* Varies with size of sheet used and spacing of battens

"Monel" is a registered trade-mark of The International Nickel Company, Inc., which is applied to a nickel alloy containing approximately two-thirds nickel and one-third copper.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street
New York, N. Y.

NOW

ALL THE ADVANTAGES OF THE H & C TURNING BLADE VALVE

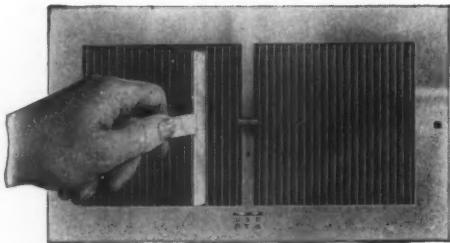
Plus

QUICK ADJUSTABILITY TO ANY DEFLECTION ON THE JOB

Are Combined

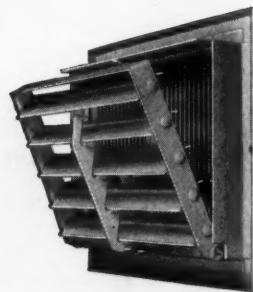
IN ONE SURPRISINGLY LOW-PRICED REGISTER

The No. 75 **H & C** Design



The flexible fins in each section are formed from a single piece of steel and deflection required may be obtained by simply twisting the fins with tool furnished with each item.

The Register You're
Bound to Use Eventually
if You're Interested
in Better Results
at Moderate Cost



The turning blade valve may be instantly adjusted to: UP, STRAIGHT or DOWN. Blades turn every bit of the air smoothly and uniformly to every portion of the register face.

ONLY WITH THE H & C TURNING BLADE VALVE CAN THESE RESULTS BE SECURED

FAR LESS TURBULENCE AND NOISE

ACTUALLY LESS RESISTANCE THAN IF NO REGISTER WERE USED

UNIFORM VELOCITY TO EVERY PORTION OF REGISTER FACE

WHICH PERMITS SMALLER REGISTERS IN MANY CASES

WITH SUBSTANTIAL SAVINGS TO YOU!

Why not investigate this sensational Register AT ONCE. Ask your jobber about it . . . Shipments are now being made from stock.

HART & COOLEY MANUFACTURING CO.

Warm Air Registers • Air Conditioning Grilles • Damper Regulator Sets • Dampers • Chain • Pulleys

FACTORY AND ENGINEERING SALES OFFICE:

HOLLAND **H & C** MICHIGAN

Chicago Office: 61 W. Kinzie St. Philadelphia Office: 1600 Arch St.

LVE
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ER
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UP.
s turn
y and
of the
RED

"Three cheers for Harvey Manny!"

He's Right! Let's Get the Training that Will Help Us Protect Our Birthright-*Now!*"

**Harry C. Mosher, Vice-President and General Manager
of the Round Oak Company, Applauds Progres-
sive Move To Advance Warm Air Heating Industry.**

Let me add my voice to that of J. Harvey Manny, President of the Robinson Furnace Company, who last month in this publication courageously took a stand for the ultimate good of the warm air heating industry.

I hold with "Harv" Manny that the only way to lick the problems of our business is to provide our dealers, distributors and service men with "training—training of the right kind."

Only by following this course can we protect our natural inheritance, which is the heating market of America . . . the richest in the world.

Here is the situation, as I see it.

We who manufacture the country's advanced forced warm air heating equipment cannot escape the responsibility of providing our manpower with a new skill to meet new problems and conditions. So let us face the facts.

We manufacturers are too busy building to become educators. Yet the industry's crying need is for specialized training for the man on the sales and installation firing line.

Isn't it sensible to entrust the job to experienced specialists? I heartily agree with Mr.



Manny, when he nominates the Industrial Training Institute as being qualified to do this job for us.

In this advertisement, made available to me by the organization which I am glad to recommend, as their contribution to the warm air heating industry, I address myself especially to men, both in and out of the industry.

And here, again, I see "eye to eye" with "Harv." I, too, would like to see every man now in our industry take such training. He is dead right, however, when he says that veterans of many years' service will soon be retiring. And since the need of the industry is so urgent, it is quite logical that these veterans must be replaced with new and younger blood, much of which will have to come from outside the industry.

So I say to men—in and out of this industry—if you are interested in securing the type of practical training that will help you grow and prosper with this industry, write me, and I will see that you get full information about this practical type of training.

Harry C. Mosher

*Vice-President and General Manager
ROUND OAK COMPANY • DOWAGIAC, MICHIGAN*



information- PLEASE!

SHEET METAL CONTRACTOR: "Hello, is this the ARMCO Distributor? Can you give me some information about this paint-gripping galvanized sheet I've been hearing about?"

ARMCO DISTRIBUTOR: "You bet! It's called galvanized ARMCO PAINTGRIP, and is *bonderized* at the mill. With this sheet you can offer your customers the full protection of galvanizing *plus* the immediate beauty and protection of paint. There is no need to weather or acid-etch the sheet before painting."

S. M. C.: "Is it true that it actually preserves paint?"

A. D.: "That's right. You see, there are certain zinc salts on a galvanized coating that dry out paint and make it crack and peel. Because PAINTGRIP has a neutral surface film that separates paint from the galvanizing, it greatly retards this drying-out action."

S. M. C.: "Fine—that'll save time and trouble, but how does the sheet work?"

A. D.: "PAINTGRIP works as easily as any good galvanized sheet, and it solders well too."

S. M. C.: "O.K. How much does it cost?"

A. D.: "You'll be surprised at the reasonable price of PAINTGRIP. For instance, 24-gage PAINTGRIP sheets on the average cost less than half a cent per square foot more than plain galvanized. This low first cost, plus the fact PAINTGRIP helps you produce better-looking, longer-lasting jobs, makes it a real buy for you and your customers."

For quick, helpful answers to any questions you may have about this money-making, paint-gripping sheet, just call the nearby ARMCO Distributor, or write us direct. The American Rolling Mill Co., 1240 Curtis St., Middletown, O.

ARMCO



PAINTGRIP SHEETS

SPEAKING OF SNIPS



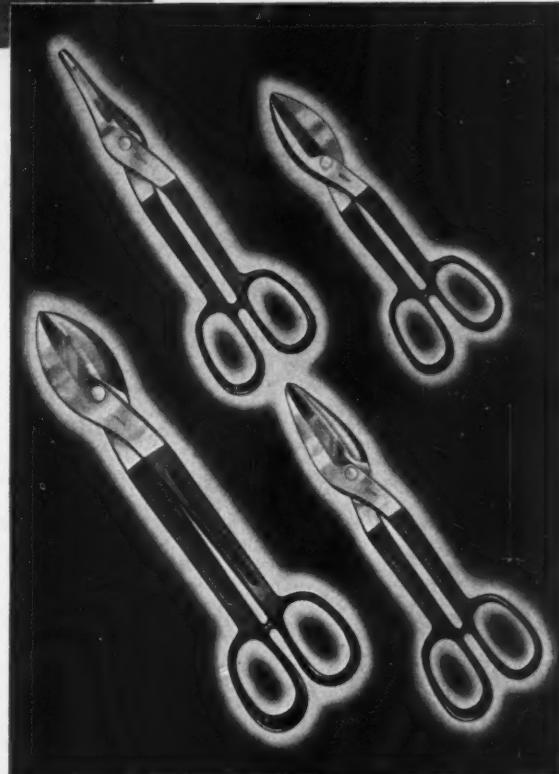
CRESCENT
OFFERS
A TYPE
FOR EVERY
CLASS OF
SERVICE

Photo courtesy of
The Wittemann Co., Inc.

- Four different types or patterns comprise the Crescent Snip line. In addition to the standard pattern, Crescent offers circular-cutting snips, combination snips, and heavy-duty types. Choose the pattern that fits your needs and you will get better performance and longer life out of these fine tools.

All Crescent Snips are distinguished by many exclusive design and utility features—scientific blade contour that provides a perfect shearing angle *always*—flush bolts—gently bevelled shoulders, and solid forged blades that are hardened clear through. Ask your hardware or mill supply distributor about these popular-priced tools today.

CRESCENT TOOL COMPANY, Jamestown, N.Y.



CRESCENT and Smith & Hemenway **TOOLS**



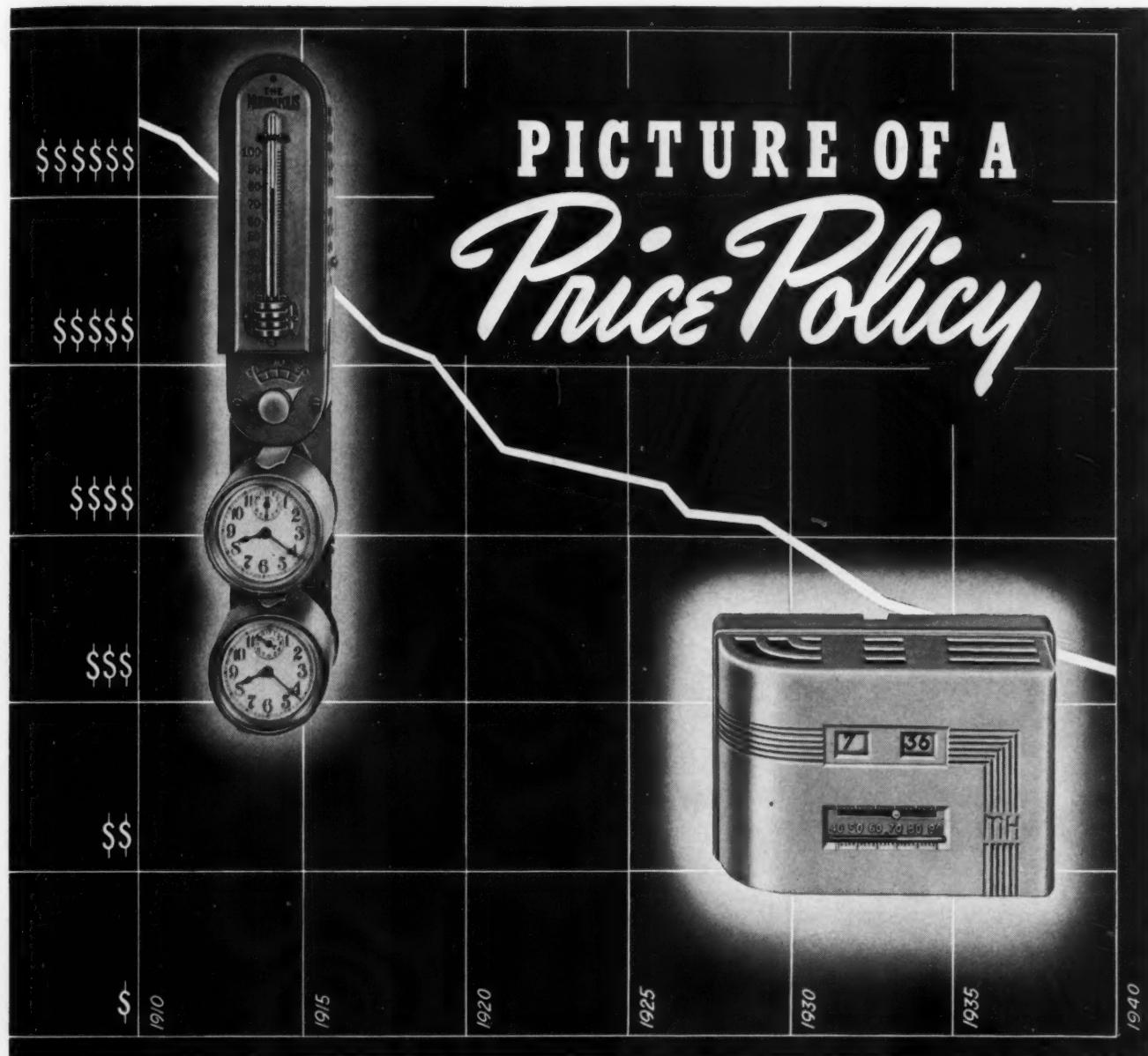
KEEPING QUALITY *and* PRICE IN BALANCE...

Most of us, if we could, would buy only the best of everything. It is human nature to want a fine home, a high priced automobile and so on indefinitely. This desire for more of the good things of life often leads folks to buy "cheap", but rarely do they blame themselves when the purchase turns out to be a poor bargain.

In the long run, no one profits from a sale which has low price as its chief recommendation. But, add value—and regardless of price—the buyer and seller are helping one another. Year after year OSBORN sheet metal, warm air heating, and roofing products continue to satisfy thousands of successful sheet metal men. Their confidence that OSBORN materials aid them in keeping both the quality and price of their work in balance is an asset which we prize most highly.

THE J. M. & L. A.
OSBORN Co
Manufacturers—Distributors
BUFFALO • CLEVELAND • DETROIT

A DEPENDABLE SOURCE OF SUPPLY FOR 81 YEARS



● In addition to constantly improving performance, Minneapolis-Honeywell has consistently reduced control prices. Down through the years its engineers have kept pace with the increasing demands of the automatic heating industry. They have matched new developments with new controls, always working toward the goal of greater values. Compare the price of the thermostat of even ten years ago with that of the 1940 Chronotherm pictured above. Then compare the performance. Fifty years have proved that standardizing on Minneapolis-Honeywell is sound sales insurance for manufacturer and dealer.

MINNEAPOLIS-HONEYWELL

Minneapolis-Honeywell Regulator Company, 2726 Fourth Ave. S., Minneapolis, Minn. Canadian Plant: Toronto, Ontario. European Plant: London, England. Company owned branches in 49 other cities.

Control Systems

LOOK! Amazing New Retail Business!



PHILCO-YORK AIR CONDITIONERS

*Real, Complete, Portable
Air Conditioning! Easy-to-Handle
Package Merchandise!
No Plumbing — No Wiring!*

Now—Efficient Air Conditioning for Home and Office at a price the public can pay!

Model 61 shown above. Gives *complete air conditioning service!* Draws in fresh outside air . . . wrings the moisture out of it . . . filters out dust and pollen . . . COOLS it . . . and gently circulates it about the room. Stale inside air is rapidly removed and constantly replaced with fresh, filtered, clean air—brisk and energizing. Street noises are shut out. You live and work in peaceful comfort, regardless of outdoor weather! And it's priced amazingly low.

MAIL COUPON NOW!

PHILCO, Air Conditioning Dept. 519
Tioga and C Streets, Philadelphia, Pa.

Please send me full details of your dealer franchise proposition on Philco-York Air Conditioners, together with Discounts and Special Wholesale Credit Terms. Also send big, new Illustrated Book.

NAME

STREET COUNTY

CITY STATE

Yes, portable Air Conditioning—the next great, fast coming big profit business for the retail appliance dealer!

Growing even faster today than electric refrigeration in its early days. And no trade-ins! No saturation! No expert service! Big dollar profit! And you sell and deliver in an easy-to-handle package.

And what a market! Millions of professional and business offices—millions of hotel and hospital rooms—millions of bedrooms, dens, dining rooms, and libraries, in residences from coast to coast. And the greatest repeat business in the history of appliance merchandising. Three or four sales to a single home. Dozens and even hundreds of units in a single office building, hotel or hospital.

The *first* to bring you real full-fledged portable easy-to-handle air conditioning . . . Philco-York, for 1940, now gives you the most *complete* line of portable air conditioners ever offered. A model to cover every field . . . and at *new low prices!* Easily and quickly installed—no plumbing, no wiring. Plug into any electric socket.

Limited and restricted dealer distribution—write today—immediately—for full details of the Philco-York Air Conditioner dealer franchise, dealer discounts, special credit terms, and full, free, beautifully illustrated descriptive literature.

There's a Philco-York Air Conditioner for every size room, now priced as low as . . .

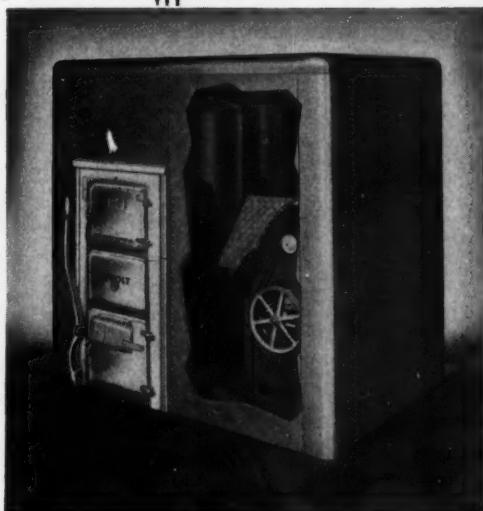
\$129.50

RYBOLT

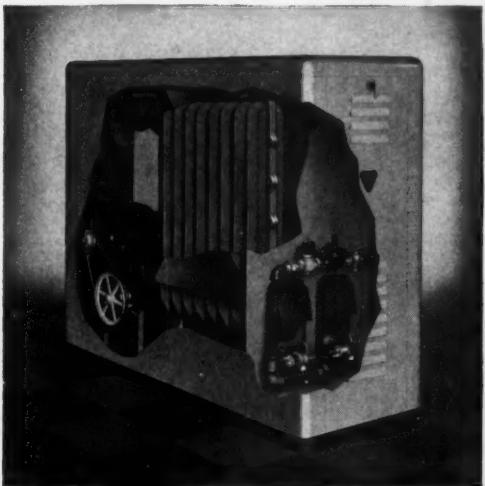
3

NEW RYBOLT PRODUCTS

To help round out your heating sales



RYBOLT STEEL COAL-FIRED
WINTER AIR CONDITIONER



RYBOLT CAST GAS-FIRED WINTER
AIR CONDITIONER



With the addition of these three interesting new products the RYBOLT line is made more extensive and complete than ever before to cover a wider range of heating conditions and to open a larger and more profitable market for the RYBOLT dealer.

RYBOLT STEEL COAL-FIRED WINTER AIR CONDITIONER . . . Series 4200

This new RYBOLT unit, Series 4200, is thoroughly modernized, smartly styled and moderately priced. A special feature is the full height reversible blower cabinet which can be placed on either side of the unit. Compact in design, the cabinet is handsomely finished in lustrous gray Hammerloid enamel. The Gravity Furnace, Series 4000 round casing, is furnished in galvanized finish; the square casing is furnished either in gray Hammerloid finish or galvanized. Available for stoker firing, with special chutes and cover plates, Series 4100.

RYBOLT GAS-FIRED WINTER AIR CONDITIONER Series CG

Completely new in design, this unit, Series CG, embodies many advanced features which contribute unusually high efficiency. Combustion chamber of durable gray iron castings of even, uniform thickness, special flue economizer and scientific baffling promote economy of operation. Cabinet of gray Hammerloid finish is inner lined with a sheet metal baffle. Sturdy construction; simple and accessible to service. Gravity Gas Furnace Series CGG has same heating element and same finish.



RYBOLT OIL BURNER
Series 4400

Embodies the most advanced principles of modern oil burner design. Completely automatic, safe and inexpensive to operate. Readily installed in any make of furnace. RYBOLT Oil Burner Winter Air Conditioner unit Series 4400 is furnished complete with RYBOLT Oil Burner or sold without burner for use with any type oil burner.

Write for Illustrated Folders and Price Lists

THE RYBOLT HEATER COMPANY
615 MILLER STREET • ASHLAND, OHIO

ANNOUNCE

LONG-LIFE
CONSTRUCTION



BACKED BY
TWO-FISTED
SALES AND
ENGINEERING
HELPS

JANITROL

FOR
1940

INCING

The Smartest Thing On "Main Street!"

A BRAND-NEW NUMBER IN A WINTER AIR CONDITIONER

HAS COME TO TOWN! (FROM THE BLUE-BLOODED JANITROL FAMILY, TOO)
YES SIR, MISTER DEALER . . . COMPLETELY ASSEMBLED - FACTORY
INSPECTED - STYLED UP TO THE MINUTE - A SALES "NATURAL"!!!

What've you always wanted in the heating units you sell? A factory made - factory assembled - factory inspected job - ready for work and steady for profit? Janitrol for 1940 hands these features to you on a silver platter. Haven't you wanted to get away from difficult labor estimates - estimates that ate up all the profits when something "went wrong" on the job? - Janitrol cracks this tough nut for you. Haven't you wanted style - compactness -

neatness - simplification? Well, that's where Janitrol shines.

Janitrol bristles with all these sales features plus engineering and mechanical contributions that will make you sit up and take notice. Every one of them is gauged to make greater profits for you. The line is complete, too, - every needed size. We're over the "dirty 30's" now. Climb aboard the profits-ahead wagon with Janitrol during the "fortunate 40's."

SURFACE COMBUSTION CORPORATION • TOLEDO, OHIO
Don't put it off! Write for More Details on
THE SEASON'S "CATCH" IN SALES APPEAL!



NEW
"MULTI-THERMEX"
HEAT
EXCHANGER



One dealer said "The slickest thing I ever saw." You'll say so, too, when you see the new Multi-Thermex Combustion Tubes. No great bulk - yet no skimpiness - a new treatment in cast iron heat exchanger principle and design that works like magic. Out comes the heat from the hot gases of combustion - into the air stream right where it's needed. Efficiency makes possible new compactness - new long life - new simple servicing. MULTI-THERMEX - many heat-exchangers - get it! When you see it, you'll know you really have something.



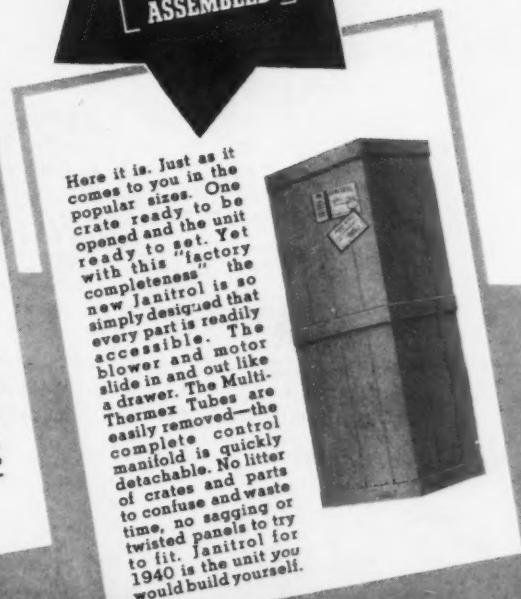
NEW
"AMPLIFIRE"
BURNERS



Here's a new Janitrol designed - Janitrol tested burner you're going to hear a lot about. A short, sharp, continuous, intense flame that gives ample heating capacity in a minimum of space. It's so efficient it takes a little heat and makes it go a long way. It's easy to adjust, too, and easy to inspect and coupled with the famous Janitrol safety pilot, it's an unbeatable combination of dependability - safety -

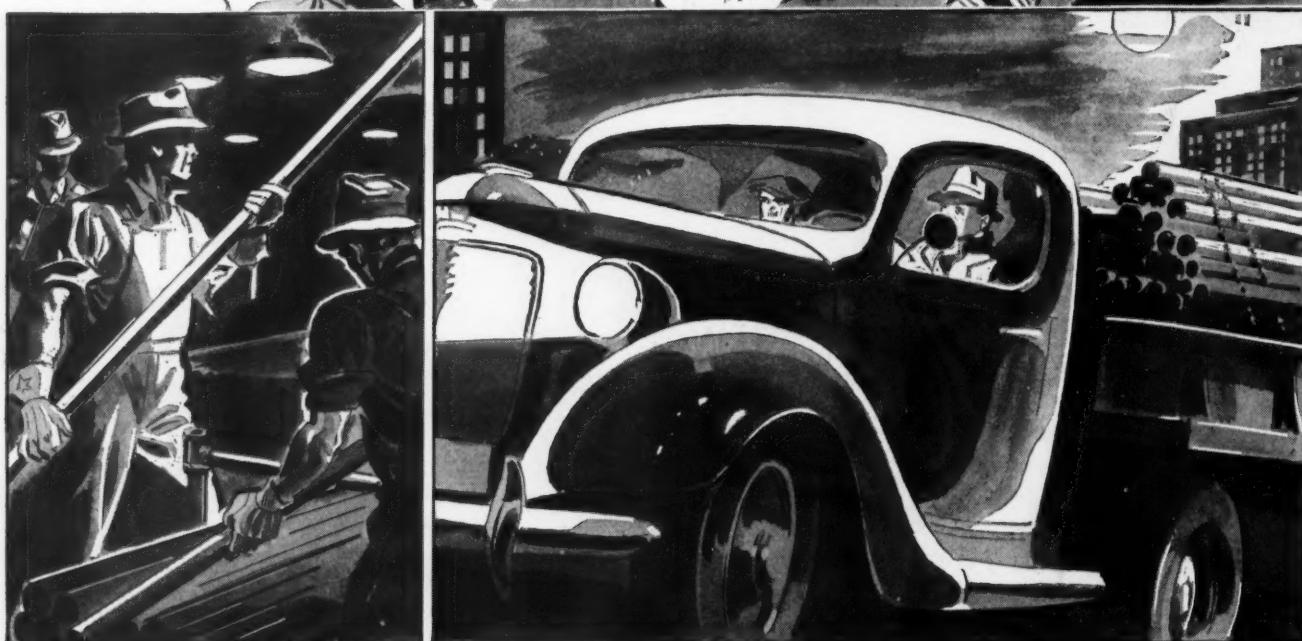


NEW
PACKAGING
[COMPLETELY
ASSEMBLED]



Here it is. Just as it comes to you in the popular sizes. One crate ready to be opened and the unit ready to set. Yet with this "factory completeness" the new Janitrol is so simply designed that every part is readily accessible. The slide in and out like a drawer. The Multi-Thermex Tubes are easily removed - the complete control manifold is quickly detachable. No litter of crates and parts to confuse and waste time, no sagging or twisted panels to try to fit. Janitrol for 1940 is the unit you would build yourself.

**YOU COULD HAVE HEARD
HIM WITHOUT
THE PHONE!**



1. "An emergency call for a set of boiler tubes was received after closing hours by our St. Paul warehouse."

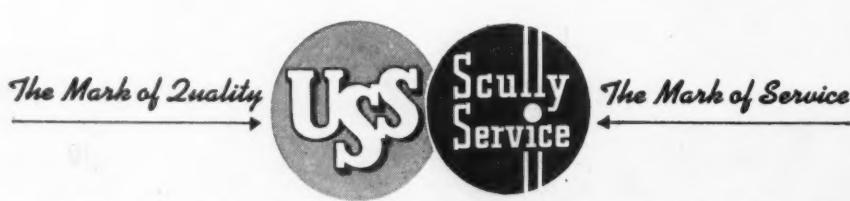
2. "Our plant contacted the truck line and had the tubes ready by the time the truck arrived for pick-up. Delivery was effected at 8:00 o'clock the next morning, 225 miles from St. Paul."

NO wonder he was excited! Here it was after closing hours and a boiler down . . . and, our warehouse 225 miles away! We swung into action, loaded the necessary tubes onto a truck and delivered them the next morning. But that was an emergency,

you say—what about regular orders? Thousands of Scully customers can tell you that we operate on the basis that all orders are wanted immediately. And no matter how large or small your order may be it will receive the same friendly attention and be shipped

at once. That's Scully Service.

Why not call Scully the next time you need steel and see for yourself why Scully Service has become famous? And if you do not have a copy of our handy Stock List and Reference Book, ask for one. It's free, of course.



SCULLY STEEL PRODUCTS COMPANY

Distributors of Steel, Steel Products, Copper and Brass
Warehouses at CHICAGO • NEWARK, N. J. • ST. LOUIS • BOSTON
ST. PAUL-MINNEAPOLIS • CLEVELAND • PITTSBURGH • BALTIMORE

**UNITED
STATES
STEEL**

WHAT! no cream or sugar?



(1) AUTOMATIC
HEATING



(2) AIR
CONDITIONING



(3) COMMERCIAL
REFRIGERATION

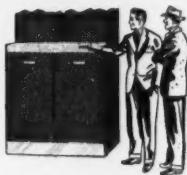
Get all three

...TURN TO 

FOR YEAR 'ROUND PROFITS
G-E gives you something to
sell every month in the year.

PROFITS from HEATING

This year General Electric offers you the best heating set-up—the most complete line—in G-E history.



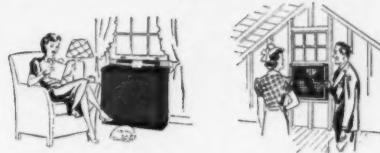
This year, too, more people than ever before are asking about G-E Automatic Heating equipment!

When you're a G-E Dealer you get (1) highest quality equipment, (2) complete lines—oil and gas, (3) a typical G-E healthy profit set-up, (4) national advertising to soften up your market, (5) local cooperative advertising and dealer promotion material to help you cash in.



PROFITS from AIR CONDITIONING

After the heating season, don't hang-up your salesmen—let them jump right into Air Conditioning! G-E gives you a *complete* line for cooling



one room, a group of rooms or a whole house. And "Packaged Weather" units for winter, summer, or year 'round air conditioning of shops, stores and offices.

And G-E Air Circulators are "naturals" for lower income homes, offices, stores and factories.

PROFITS from COMMERCIAL REFRIGERATION

To round out your profit set-up, there's the complete G-E Commercial Refrigeration line.

Water Coolers—every type for every need. Bottle Beverage Coolers, Food Storage and Display Cabinets—a complete line to meet the needs of all kinds of business.

In addition: Condensing Units, Cooling Units, Evaporative Condensers, equipment for Walk-in Refrigerators, Locker Storage plants, etc.



Now, as never before, you can count on General Electric for year 'round prospects *and profits*.

GENERAL ELECTRIC

*Automatic Heating, Air Conditioning and
Commercial Refrigeration*

GENERAL ELECTRIC COMPANY
Div. 199-453, Bloomfield, New Jersey

I want details on the new G-E Dealer Franchise for my territory. I am interested in Automatic Heating Summer Cooling Commercial Refrigeration.

Name _____

Street _____

City _____ State _____



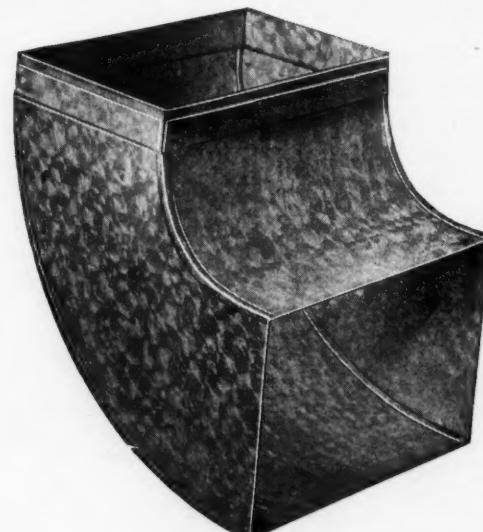
The **INDUSTRY'S LEADER!**

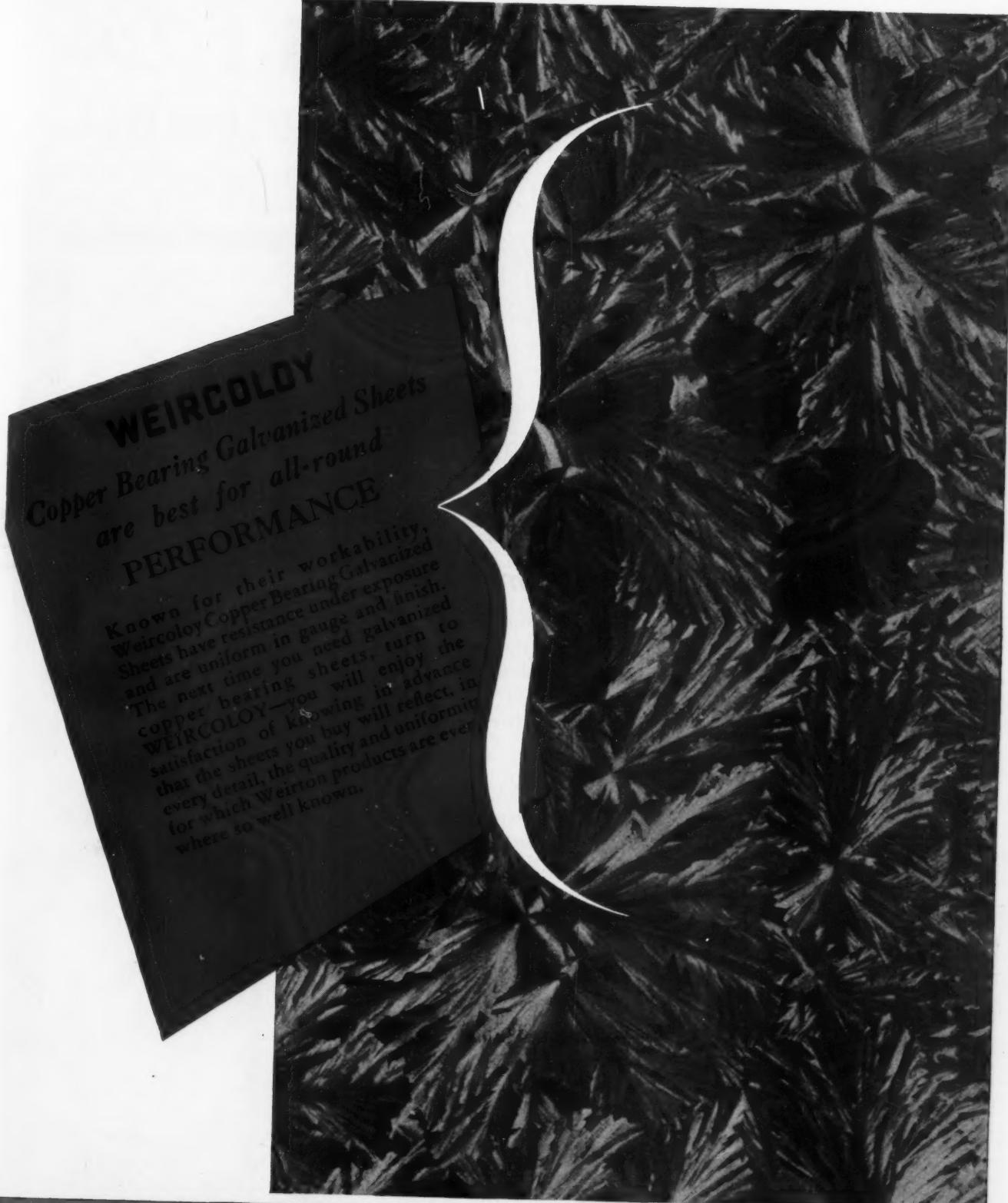
No matter whether the job calls for ordinary wall stacks, elbows and the other needs of a simple gravity job or for the latest and most carefully designed duct-work on a complicated forced-air-conditioning installation — HANDY pipe will meet **EVERY** need—and you **KNOW** the costs **BEFORE** you bid.

With apologies to Packard, we can well say "Ask the Man Who Has Used It" about HANDY pipe.

F. MEYER & BRO. CO., Peoria, Ill.

Our Catalogue No. 52 is a free guide to everything needed in the installation of warm air furnaces and forced-air-conditioning systems. If you haven't one, your information isn't up to date.





WEIRTON STEEL COMPANY

Boston, 1324 Statler Office Building; Chattanooga, Hamilton Bank Building; Chicago, 2128 Builders Building; Cincinnati, 2606-7 Carew Tower; Cleveland, 1217 Leader Building; Denver, John S. Worthington Co., 511-513 Mercantile Building; Detroit, General Motors Building; Houston, 1901 Franklin Avenue; Indianapolis, Chamber of Commerce Building; New York, 405 Lexington Avenue; Philadelphia, Broad Street Station Building; Rochester, Genesee Valley Trust Building; San Francisco, 824 Sharon Building; St. Louis, E. R. Hensel Company, Cotton Belt Building; Montreal, Quebec, A. C. Leslie & Co., Ltd., P. O. Box 1420; Toronto, Ontario, A. MacNish, 357 Bay Street.

WEIRTON, W. VA.

division of

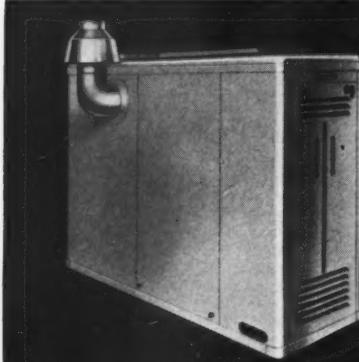


NATIONAL STEEL CORPORATION

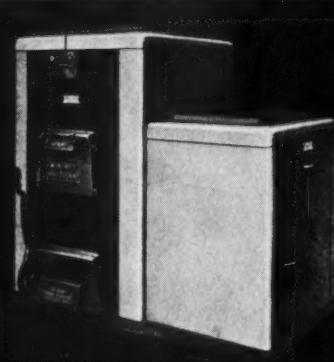
Complete MONCRIEF Line

ENLARGES YOUR PROFIT OPPORTUNITIES

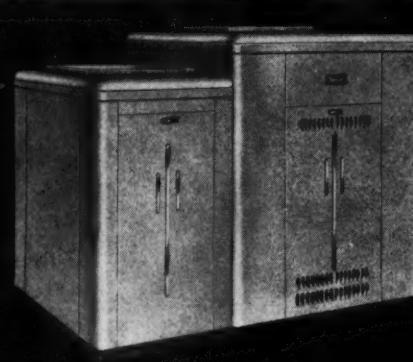
ARISTOCRAT GAS-FIRED
WINTER AIR CONDITIONER



ARISTOCRAT COAL-FIRED
WINTER AIR CONDITIONER



ARISTOCRAT OIL-FIRED
WINTER AIR CONDITIONER



Aristocrat Winter Air Conditioners ↑

Get acquainted at once with all that the Moncrief Winter Air Conditioners offer in design, efficiency and convenience. Whether the house be large or small, Moncrief can supply a unit of exactly the right size and type, specially designed for burning coal, oil or gas, with economy. All attractively priced.

Warm Air Furnaces →

Whatever the call for a furnace, cast or steel, you can meet it best with a Moncrief. All Moncrief Furnaces are made of qual-

ity materials, present features that give you strong selling points. Priced to give real values and pay you good profit.



NEW This Year

DELUXE LONG LIFE

With 20-Year Guarantee

If you want to get away from price competition, and sell a gravity furnace on merit and long time satisfaction, here is the unit for you. It presents style, guaranteed quality and convenience. This is your big profit opportunity for 1940.

Let us explain the Moncrief Proposition.

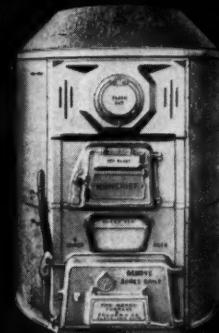
THE HENRY FURNACE & FOUNDRY CO.
3473 East 49th Street

Cleveland, Ohio

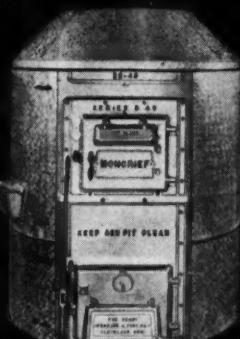


Moncrief Supplies Everything Used on a Warm Air Heating and an Air Conditioning Job.

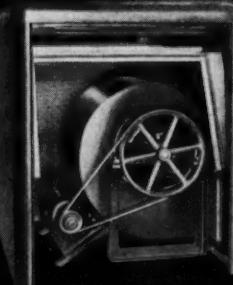
SERIES
"C"
CAST
FURNACE

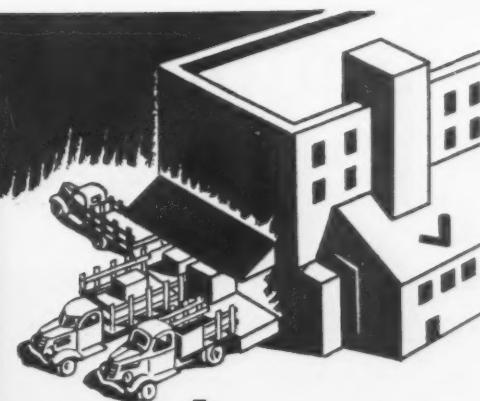


SERIES
"D-40"
STEEL
FURNACE



MONCRIEF
BLOWER-
FILTER
UNIT





Why Not

MAKE THE
HUSSEY WAREHOUSE
YOUR
STOCKROOM

for everything in Copper?

There's no need to carry heavy inventories of copper and brass with Hussey at your beck and call. Just reach for your telephone and call the nearest one of the seven completely stocked Hussey Warehouses, strategically located in the principal industrial centers.

You always have a 100 per cent choice of copper, brass and bronze materials, including Sheets, Rolls, Rods, Tubing, Wire. Also a full line of pre-formed roof drainage products, such as shingles, conductor pipe, eaves troughs, hangars, ridging, including Genuine Majestic 3-Way Super Bond Copper Flashings and Brass Floor Dividing Strips for composition floors, etc.

Contact Your Local Hussey Warehouse Today!

CHICAGO WAREHOUSE
212 S. Jefferson St., Chicago, Ill.
Telephone HAYmarket 5607

CINCINNATI WAREHOUSE
424 Commercial Sq., Cincinnati, O.
Telephone MAin 2833

CLEVELAND WAREHOUSE
5318 St. Clair St., Cleveland, O.
Telephone HEnderson 7695

PITTSBURGH WAREHOUSE and ROLLING MILLS
2850 Second Avenue, Pittsburgh, Pa.
Telephone GRant 3650

NEW YORK WAREHOUSE
140 Sixth Ave., New York, N.Y.
Telephone CANal 66326

PHILADELPHIA WAREHOUSE
1632 Fairmount Ave., Philadelphia, Pa.
Telephone FREmont 5037

ST. LOUIS WAREHOUSE
1620 Delmar Blvd., St. Louis, Mo.
Telephone CEntral 9192

Copper

HUSSEY

Brass

C. G. HUSSEY & CO.
(Division of Copper Range Co.)

Rolling Mills and General Offices:
PITTSBURGH, PA.

Simplify Gas Space Heating with these Penn Solenoid Valves

*All Sizes Supplied in Same
Heavy Duty Construction*

Penn Solenoid Gas Valves are available for a wide range of low pressure combustion applications in sizes and capacities as shown in the table at the lower right. This wide range of sizes will meet most domestic space heating needs, on manufactured, mixed or natural gas. These valves, when equipped with low voltage coils, are tailored for use with Temtrol, Penn's anticipatory or auxiliary heat actuated room thermostat, providing unsurpassed comfort control with gas fired heating



equipment. Because of their simplicity and dependability, these valves also are widely used on industrial applications requiring positive, snap-acting gas control equipment, automatically operated to maintain close control of temperatures or pressures.

Penn Electric Switch Co., Goshen, Indiana.
In Canada: Powerlite Devices, Ltd., Penn Electric Switch Division, Toronto, Ont. Export: 100 Varick St., New York City. Representatives and distributors in all principal cities.

More information on what Penn Controls will do for you—One of a Series.

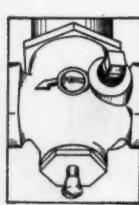
PENN



Field Tested Under All Conditions — A. G. A. Listed

For more than two years Penn Solenoid Gas Valves have been undergoing the most rigid laboratory and field tests. Designs have been submitted to installation and service engineers for suggestions and criticisms. The result is a valve that is simple to install, quickly accessible for field inspection and service, and compact and attractive in appearance. Impact plunger of exclusive new design provides generous reserve power. Extremely quiet in operation, an especially valuable feature on domestic heating installations. Machined and polished spherical face valve seat is removable for inspection or replacement. Valve disc is special oil treated "meter" sheep skin, assuring a permanently tight seal unaffected by metal particles and especially resistant to wear over many years of operation. Valve body is dense cast nickel iron, an alloy widely used on

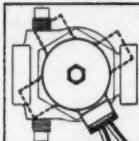
refrigeration compressors at extremely high pressures. Conduit bushing may be rotated to most convenient position for wiring. Available for low or line voltage pilot control—all commercial voltages and frequencies. Low voltage valves supplied with transformers. Plugged tapping in each side of valve body provided for gas pilot connection. Coil and all operating parts easily accessible for inspection without removing valve from line.



Penn Solenoid Gas Valves are available with semi-automatic manual opening mechanism for use in case of power failure or on new home construction before electrical connections are made. Automatically recloses upon return of current when pilot circuit is closed. Specify when ordering.



"Meter" sheep skin disc firmly supported both at the center and the outer rim assures long operating life and a permanently tight seal unaffected by foreign particles. Quiet in operation.



You can easily turn the cover of the Penn Solenoid Gas Valve to the most convenient location for wiring entirely independently of the "direction" in which the valve body is mounted. Two wire hook-up, plus this feature, speed up installation.

Choice of Capacities for Any Application

CAPACITY*	VALVE SIZE I. P. T.	VALVE TYPE NUMBER	COIL VOLT- AGE
25	1/4"	920L02	Low
25	1/4"	920H02	Line
135	5/8"	921L03	Low
135	5/8"	921H03	Line
165	3/4"	921L04	Low
165	3/4"	921H04	Line
310	3/4"	921L06	Low
310	3/4"	921H06	Line
350	3/4"	922L06	Low
350	3/4"	922H06	Line
435	1"	922L08	Low
435	1"	922H08	Line

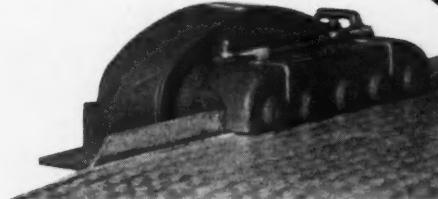
*Cu. Ft. per hour based on gas of .6 specific gravity at 1/2" water pressure drop.

Penn-Built Controls for Many Applications

Thermostats, Bonnet Controls, Ductstat, Fire Protection Controls, Water Temperature Controls, Boiler Pressure Controls, Boiler Water Level Controls, Humidistats, Stack Switches, Stoker Timer Relays, Solenoid

Gas Valves, General Purpose Relays, Solenoid, Refrigerant and Water Valves, Refrigeration Pressure and Temperature Controls, Water Valves, Pump Controls, Air Compressor Controls, Air Volume Controls, Line Starters.

IT'S A *Great* SHEET FROM START TO FINISH



The more expert the workman, the more he will appreciate the uniformity and "clean looks" of Superior galvanized sheets. "It's a great sheet from start to finish" says one shop owner who has been using Superior Sheets for many years. He knows the value of uniformity in temper, thickness and coating from beginning to finish of a job. He also knows the value of turning out a finished job that has eye appeal, the sparkle that comes from a uniform pattern of spangle and careful handling of finished sheets. For your next important sheet metal job use SUPERIOR GALVANIZED. Ask your distributor for Superior Sheets.

THE SUPERIOR SHEET STEEL CO., Canton, Ohio
DIVISION OF CONTINENTAL STEEL CORP., U.S.A.



SUPERIOR
OPEN HEARTH
STRUCTURAL SHEETS



Up a Tree?

**Read these down-to-earth facts
and use Republic Taylor Ternes**

• There is no cure-all for roofing troubles—but perhaps the closest approach to one is found in Republic Taylor Ternes. These tin-lead alloy coated sheets have been sold for 130 years—installed on such buildings as Independence Hall, Philadelphia, and Immaculate Conception Cathedral, Denver—and have shown a life in service far greater than that of many more costly materials.

These are the down-to-earth facts that will interest your customers. Republic Taylor Ternes roofs are moderate in cost, easy to apply, neat in appearance, incombustible, inexpensive to maintain, and readily repaired when damaged.

May we send you additional proof of the value of this old reliable roofing—or folders that you can mail to your prospects? Write:

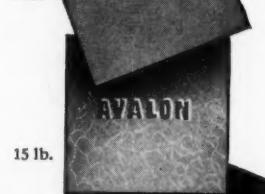


REPUBLIC STEEL CORPORATION
GENERAL OFFICES: CLEVELAND, OHIO

BERGER MANUFACTURING DIVISION • NILES STEEL PRODUCTS DIVISION
STEEL AND TUBES DIVISION • UNION DRAWN STEEL DIVISION
TRUSCON STEEL COMPANY



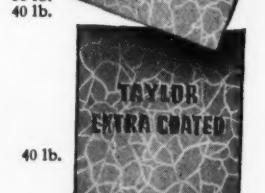
8 lb.



15 lb.



20 lb.
25 lb.
30 lb.
40 lb.



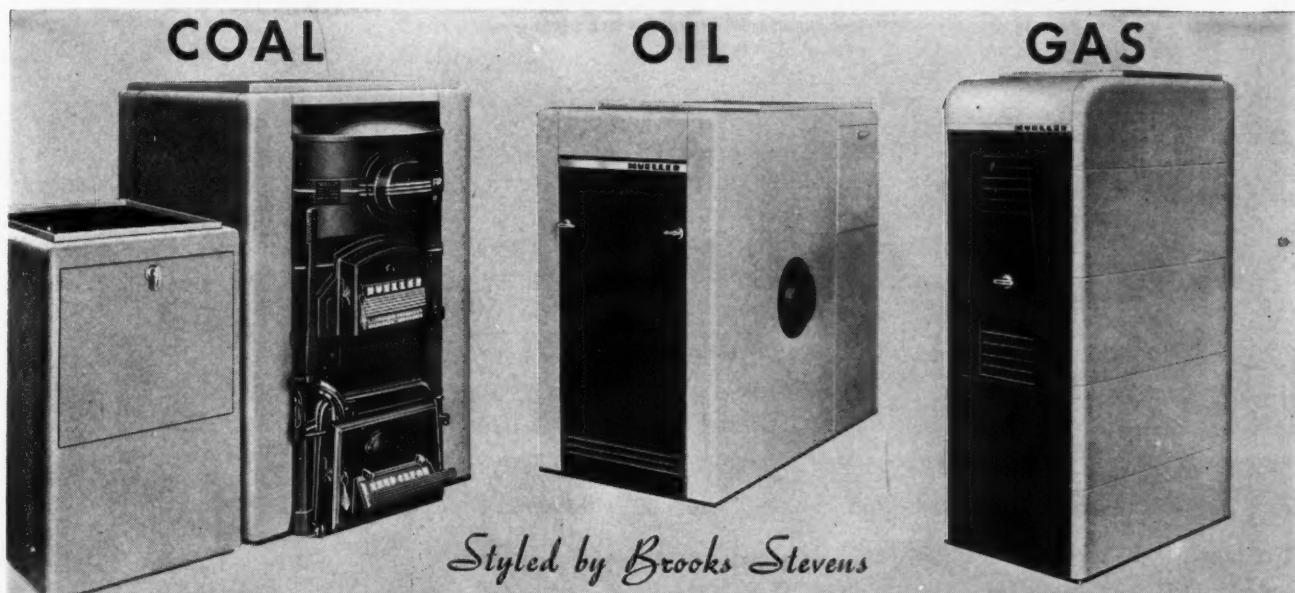
40 lb.



Special

Republic **TAYLOR ROOFING TERNES**

New MUELLER Furnaces Designed and Priced for Small Home Market



Styled by Brooks Stevens

COAL

OIL

GAS

Mueller Series "FP" Fan-Filter Furnace Unit. An old Mueller favorite in brand new style, popular with home-owners for years.

Mueller Series "50" Oil-fired Air Conditioning Furnace. Dual economy plus modern design is keynote of this outstanding unit.

Mueller Series "SHP" Gas-Fired Air Conditioning Furnace. Home-owners get economy, value, performance in this new unit.

New Styling Adds Beauty to MUELLER Coal Furnace

MUELLER, always in step with progress, has restyled the famous Series "FP" Fan-Filter-Furnace unit with an eye to increased sales for you.

But its smart new styling has not changed the sound design principles which carried this unit to fame! Retained are such features as the Duplex Grate, Hot Blast Firedoor, One-Piece Radiator.

Take advantage of the multiplied sales power, modern styling and dependable performance of this old favorite. See it today!

MUELLER Oil Furnace Makes Air Conditioning an Economical Luxury

NOW, Mueller brings the comforts of oil-fired winter air conditioning to homes of moderate price! At a price well within the reach of most home-owners, Mueller offers an amazingly compact and efficient unit—the Series "50" Oil-fired Air Conditioning Furnace. This is available with Mueller Pressure Atomizing or Mueller Vaporizing Burner, or without burner, as desired. Plan now to see it. Investigate the exceptional opportunities it gives in the Small Home Market.

New MUELLER Gas Unit is Compact, Economical and Smartly Styled

MUELLER'S new Series "SHP" air conditioning furnace offers low "first cost" as well as genuine economy of operation. "SHP" embodies in a compact, economical, smartly designed "package", those features which are ideal for small homes. The burner is of special design, with new adjustable air shutter which assures complete combustion, uniform flame distribution, and quiet operation. This new Mueller unit is also available with Mueller Heat Levelizer, if desired.

L. J. MUELLER FURNACE CO.
2010 W. Oklahoma Ave., Milwaukee, Wis.

MUELLER  **MILWAUKEE**
HEATING AND AIR CONDITIONING
COAL • OIL • GAS



**SEND COUPON TODAY FOR
COMPLETE INFORMATION**

L. J. MUELLER FURNACE CO.
2010 W. Oklahoma Ave., Milwaukee, Wis.

Please send me literature about:

Series "FP" Coal-Fired Fan-Filter Furnace Unit

Series "50" Oil-Fired Furnace Series "SHP" Gas-Fired Furnace

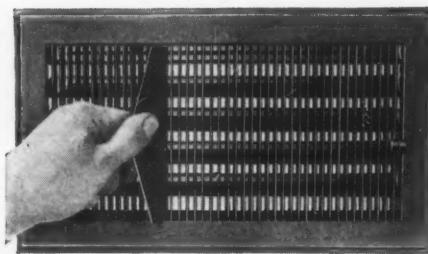
Name _____

Address _____

City _____ State _____



FULL FACE COVERAGE LINES



NEW 4 - WAY FLOW FLEX - BAR

Style 256 U. S. Air-Conditioning Register

This new development of the U. S. Air-Condition Register Line furnishes complete adjustment of Air-Flow by setting of multiple valves to any degree of Up or Down Flow required.

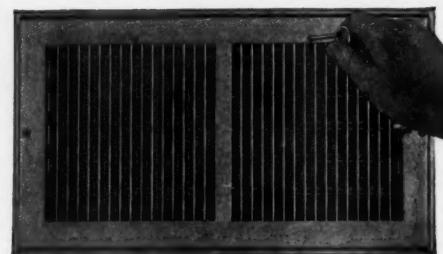
Direction of side flow is accomplished by using a handy setting wrench on the Flex-Bars in the Grille to get any Left or Right directional flow required.

This Style of Flex-Bar Register is recommended for Air-Flow setting at the time of installation. Unlike some designs of this type, the U. S. Style 256 Flex-Bar Register is durably constructed so that any required grille-bar settings may be made without damaging the register.

Americans are quality minded. In a majority of your installations people will be willing to pay for quality products, if quality is presented to them in the right way.

These 2 new U. S. Designs—256 and 249—both 4-WAY FLOWS—are lines of outstanding quality in their price classes.

Their operation is easy and perfect with comprehensive adjustments for required air flows. Nothing has been spared in the development and presentation of these two outstanding Air-Conditioning Registers.



NEW 4 - WAY FLOW MULTI - LOUVER ADJUSTABLE - BAR

Style 249 U. S. Air-Conditioning Register

This is truly the peak of perfection in Multi-Louver Adjustable-Bar Registers—proven by dealers everywhere who have installed the New STYLE 249.

There are no puzzling features to develop trouble—no "trick" untried gadgets. It gives you instantaneous regulation of any angle Up Flow to 45° Down Flow with the Side-Lever smooth operating Back-Blades. It gives you any desired degree of Side Flow to 45°—Left, Right, or Left and Right—by simply setting the vertical (key-pin-operated) Adjustable Grille Bars.

Without exception, this STYLE 249 Line excels wherever multi-louver adjustable-bar registers are specified or desired to perform a full area of face coverage air flow function.



Send for New 1940 Price Schedules

UNITED STATES REGISTER CO.

BATTLE CREEK, MICHIGAN

MINNEAPOLIS • KANSAS CITY • ALBANY • SAN FRANCISCO • NEW YORK, N. Y.

CANADIAN MANUFACTURING DISTRIBUTORS — Canada Register & Grille Co., Ltd., Toronto, Ontario

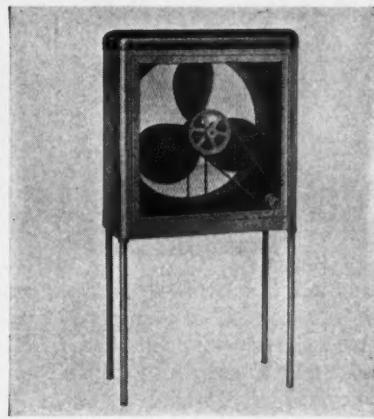


GOING GREAT GUNS!

THIS 1940 LAU
NITEAIR
ATTIC FAN AND ROOM COOLER

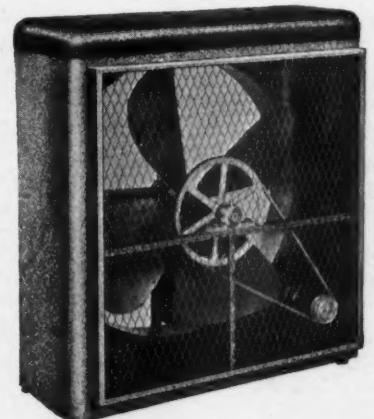
Dealer Program

IS CAPTURING DEALER ENTHUSIASM FROM COAST TO COAST



Lau Niteair Room Cooler

For house, apartment, kitchen, bedroom, office, storeroom. Low cost . . . unlimited sales opportunity.



Lau Niteair Attic Fans

Quiet, efficient, economical to operate.



Model house with miniature Niteair Unit for demonstration in home or store.

Big, easy summer profits assured through amazing dealer tested merchandising plan. Read the facts below . . . then mail the coupon at bottom of page for complete details.

- New, complete line of NITEAIR ATTIC FANS AND ROOM COOLERS.
- Soundly engineered . . . installation simplified . . . low in cost.
- Co-Operative program keyed to your community ties into your promotion efforts for real sales volume and profits.
- New advertising helps—dealer manual, direct mail, store display, new mats.
- Model house enables you to make demonstrations and close sales in shop or at prospect's home.

There's a big season ahead for Lau NITEAIR ATTIC FANS AND ROOM COOLERS . . . and fast, easy profits for dealers who cash in on this big 1940 LAU NITEAIR Dealer Program. Our amazing merchandising plan, keyed to boost sales in YOUR community, is going great guns with dealers and jobbers who have already seen it. It's such a logical program . . . it appeals to your common sense.

For 1940, Lau has perfected a new line of NITEAIR ATTIC FANS . . . and a new low cost NITEAIR ROOM COOLER that sells on demonstration. Styled smartly, quiet operating, these units are packed with sales appeal. To help you sell them, Lau offers a model house with miniature attic fan for easy store and home demonstration . . . in addition to the complete merchandising program that means more dough for you.

Don't put off getting the facts. Put your name on the coupon and shoot it off to us. We'll send you our catalog and full profit story at once.

**THE LAU BLOWER
COMPANY**
Dayton, Ohio

The swing is to Lau for summer and winter profits. NITEAIR . . . for hot weather sales . . . LAU FURNACE BLOWERS . . . for cold weather volume.



**Get This Book
MAIL COUPON TODAY**

The Lau Blower Company,
2005 Home Avenue,
Dayton, Ohio.

Without obligation, send me your 1940 Dealer Program and Catalog fully describing your complete NITEAIR Line, your Program for Dealer Helps, and your unique Co-Operative Plan. Also send me details on the Demonstration Model House.

Firm name By

Street No.

City State

SUNBEAM

OFFERS YOU LEADERSHIP

PLUS A GREAT NEW
SUMMER FINANCE PLAN
TO MAKE SELLING EASY!

NO DOWN PAYMENT
NO PAYMENTS
TILL OCTOBER 15th
JUST A FEW
DOLLARS A MONTH
YOU COLLECT CASH
ON INSTALLATION!

SUNBEAM'S national leadership brings you local leadership! Combined with this, Sunbeam offers you the greatest Summer Finance Plan in its history — planned to help you get your full share of this Spring's big replacement business. You can sell your prospects now and they won't have to pay a cent until Oct. 15th!

The complete Sunbeam line includes steel or cast iron Furnaces and Air Conditioners for oil, gas or coal — automatic or hand-fired. Coupled with a complete range of sizes and prices, you are in line for any job with Sunbeam.

And remember when you sell Sunbeam on our new Summer Finance Plan you not only get *cash on installation* — but save work and trouble too!

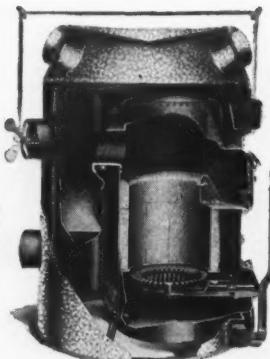
Write today for full details and for the name of the nearest Sunbeam jobber.

**AMERICAN & Standard
RADIATOR & Sanitary**
CORPORATION

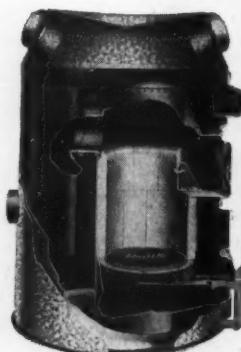
NEW YORK

PITTSBURGH

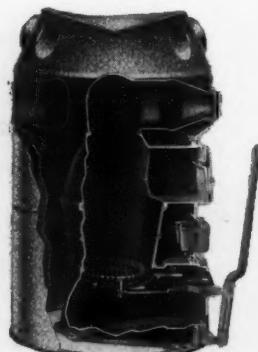
AMERICAN
HEATING EQUIPMENT
COSTS NO MORE THAN OTHERS



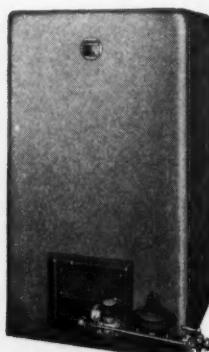
Series No. 8,000 (Steel) — For oil or coal, hand-fired or stoker. Virtually seamless one-piece units made of heavy 7 gauge boiler plate steel. The ace of Steel Furnaces.



Series No. 500 (Steel) — Low in cost yet has many "high priced" features. Made of 8 gauge boiler plate steel. For oil or coal, hand-fired or stoker.



Series No. 1,000 — (Cast Iron) — One piece radiator, duplex grates, slip-on fronts, machine-molded castings and other outstanding features. Economical and efficient in operation.



Series SG — A new type, highly efficient gas-fired gravity Furnace with Steel heating element. Saves space—saves fuel. Beautiful green baked enamel jacket.

Copyright 1940, American Radiator & Standard Sanitary Corporation



Behind Every Pound of YOUNGSTOWN STEEL are 25,000 MEN

Behind each one of these men
is an investment of \$11,346.

You hear some people say "all steel is alike--it's made to specifications." But specifications can't include men, and the men who make it stand behind it. They are the most important factor in any steel you buy.

If you could see the pride of our Youngstown workmen as *their* steel takes form under watchful care, the painstaking caution of the chemist checking every heat as exactly as an airplane pilot checks his ship, the thoroughness with which the inspectors examine the detail of each product before they stamp their "O K" -- and our name and reputation -- on it if you could see all this and more, every hour of every day, you would know why we are proud of our products and proud of our men. Thousands of users know they can depend on the uniformity and quality of the steel to which these Youngstown workmen are devoting their lives.

Sheets - Plates - Pipe and Tubular Products - Conduit -
Tin Plate - Bars - Wire - Nails - Tie Plates and Spikes.

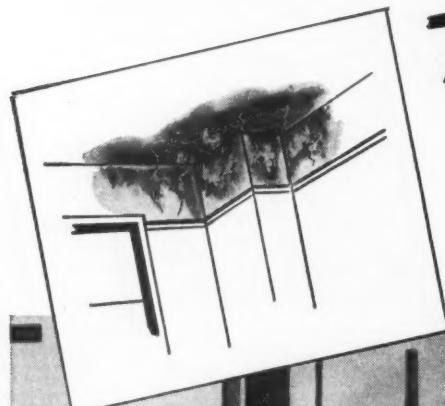
25-19C

THE
YOUNGSTOWN
SHEET AND TUBE COMPANY

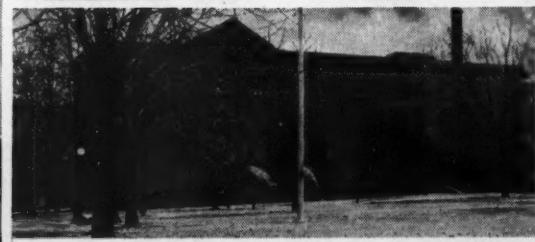
Manufacturers of Carbon and Alloy Steels

General Offices - YOUNGSTOWN, OHIO

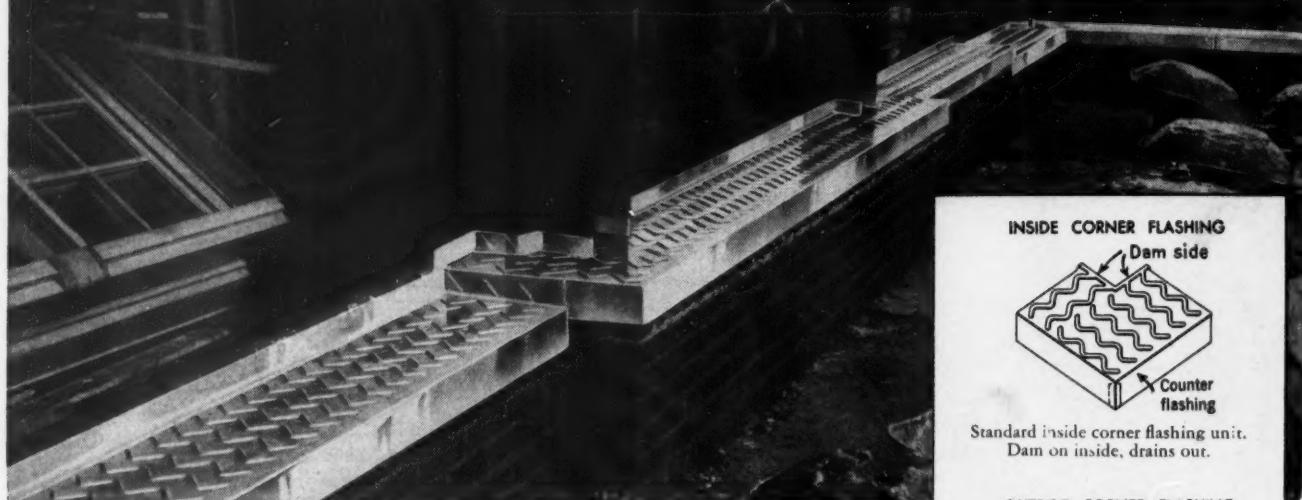




To Prevent Seepage— Use Anaconda Through-Wall Flashing



New Administration Building (inset) of the Muhlenburg Hospital, Plainfield, N. J. Architects: Crow, Lewis & Wick, New York. General Contractors: A. L. Hartridge & Co., New York. Sheet Metal Contractor: Conrad Jacobson & Son, Inc., Plainfield, N. J.



Scientifically designed copper flashing provides complete drainage control—efficiently, economically!

Seepage is common in masonry walls because of their porous nature and the possible development of hair cracks. Unless adequate drainage is provided, this seepage begins to stain outside walls and, what's worse, to damage interiors.

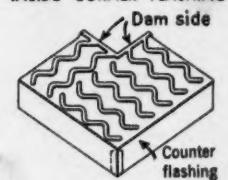
Anaconda Through-Wall Flashing provides the easiest, least expensive and most positive method

of drainage control. So designed as to drain itself dry on a level bed, this copper flashing has also been constructed to prevent lateral movement in any direction.

These and many more interesting details concerning Anaconda Through-Wall Flashing are to be found in Bulletin C-28. Ask for a copy.

-034

INSIDE CORNER FLASHING



Standard inside corner flashing unit. Dam on inside, drains out.

OUTSIDE CORNER FLASHING



Standard outside corner flashing unit. Dam on outside, drains in.

These unique one piece corner flashings are installed after straight flashings are in place. Lapping the straight flashings by two corrugations, the corner piece fits snug and secure.

Anaconda Through-Wall Flashing is made of 16-oz. copper in 5' and 8' lengths. A range of standard and special widths, also various selvages, readily adapt it to practically every brick or masonry condition.

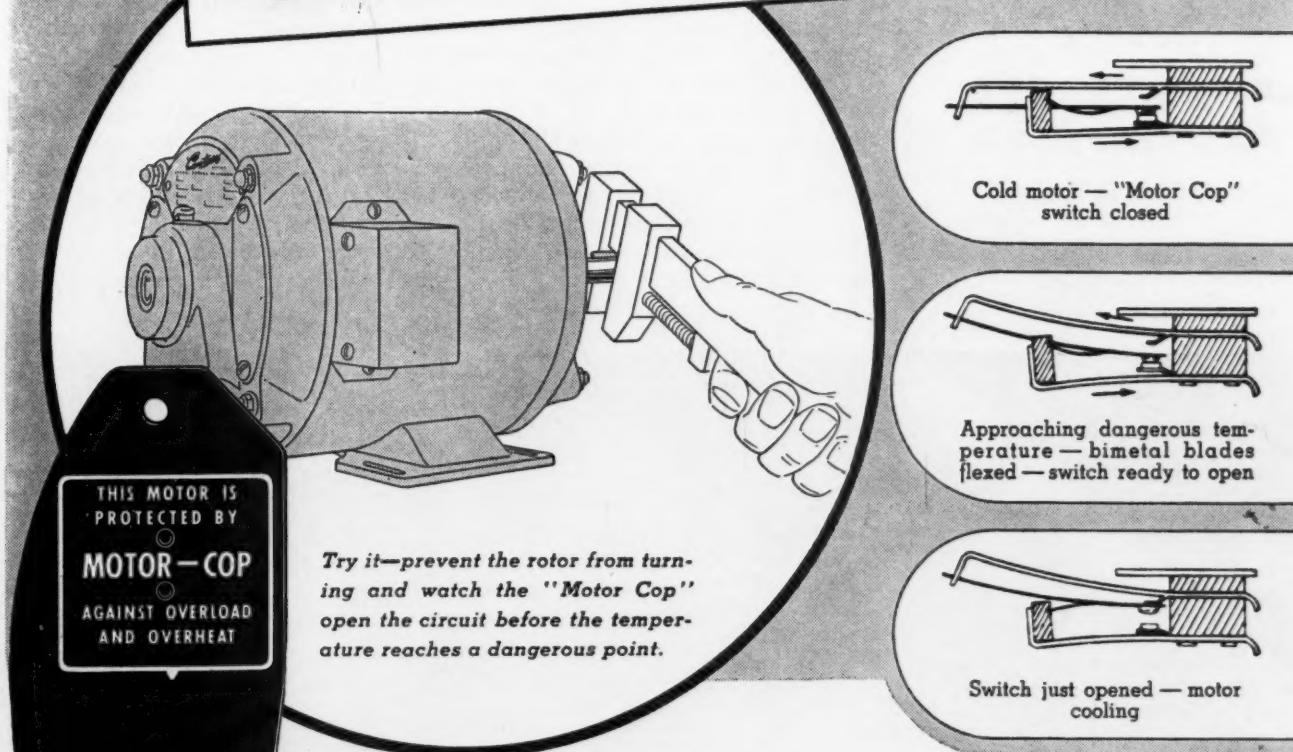


Anaconda Copper

THE AMERICAN BRASS COMPANY, General Offices: WATERBURY, CONNECTICUT

In Canada: Anaconda American Brass Ltd., New Toronto, Ontario • Subsidiary of Anaconda Copper Mining Company

Cheap Insurance Against Overload Burnouts



The "MOTOR COP" will stop the motor whenever an unsafe load is imposed on it.

Whenever an unexpected abnormal operating or surrounding condition arises that subjects the motor to destructive overload, the "Motor Cop" will stop the motor.

The "Motor Cop" is built in both automatic and manual re-set types. In the former it automatically re-starts the motor when it has cooled down to a safe temperature. In the manual type, the circuit must be closed again by hand.

Thus Century fractional horsepower motors equipped with the "Motor Cop" protect the performance of your installations by preventing destructive damage to

motors caused by high temperature or overloading or both.

The "Motor Cop" is only one Century feature your customers will appreciate. There are many other advantages in Century Motors for heating, air conditioning and ventilating applications. Find out more about the Century line and its adaptability to your installations. Call in your Century Motor Specialist today.

CENTURY ELECTRIC CO.

1806 Pine Street St. Louis, Mo.

Offices and Stock Points in Principal Cities



One of the Largest Exclusive Motor Manufacturers in the World

Satisfy your Customers

**WITH
GRANITE CITY
GALVANIZED
SHEETS**

Duct work or other sheet metal fabrication done with Granite City Soft Forming Galvanized Sheets will please your customers—help your reputation—bring you new business. Because of the ease with which they can be formed, Granite City Galvanized Sheets enable you to turn out work of neat appearance that draws praise. The spelter does not chip off at bends. Spangles are even and bright. Sheets are truly flat.

You can depend on the uniformity of every lot of Granite City Soft Forming Galvanized Sheets because they are made under extremely rigid inspection and laboratory control. Base metal is highly refined. Spelter coating is even. Gauges and sizes are always accurate. For complete satisfaction for yourself and your customers, specify Granite City Soft Forming Galvanized Sheets. Your first experience will be convincing.



GRANITE CITY STEEL COMPANY
Granite City, Illinois

Chicago . Cleveland . Denver . Indianapolis . Kansas City . Los Angeles . Louisville . Memphis . Milwaukee . Minneapolis . Moline . New Orleans . New York . St. Louis

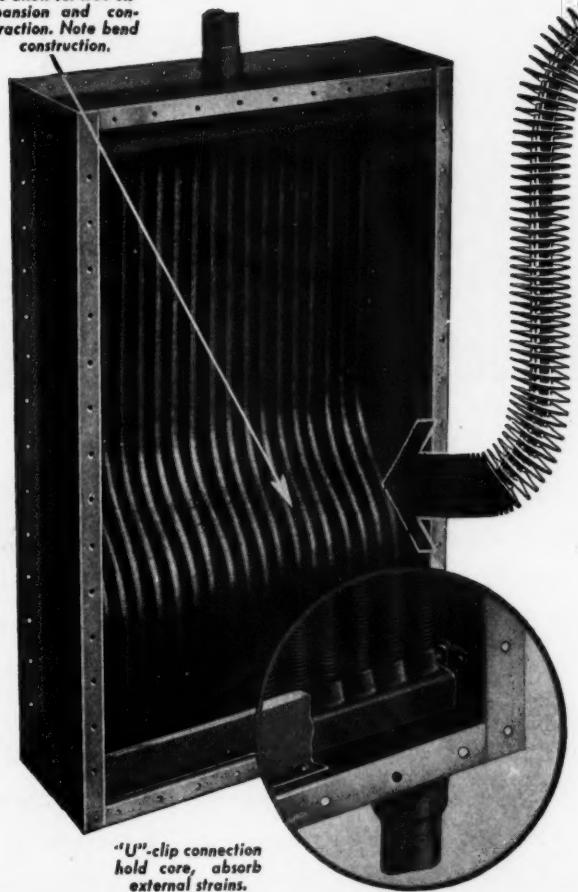
S-T-R-E-T-C-H-E-S



To reduce your
maintenance budget

THANKS to Flexitube's attention-free long life

EACH TUBE OFFSET
to allow for free ex-
pansion and con-
traction. Note bend
construction.



FLEXITUBE STRETCHES

Flexitube's ingeniously designed bend-construction permits:

1. EXPANSION AND CONTRACTION of Aerofin Flexitube Heating Coils, WITHOUT STRAIN upon themselves, the headers, header joints or the casing;
2. ELIMINATION OF STRAIN TRANSMISSION to headers and joints by expansion and contraction of each tube independent of its neighbor;
3. PEAK HEATING EFFICIENCY because it scientifically cares for sudden fluctuations in heating requirements . . . no chance for injury to coils;
4. ECONOMICAL MAINTENANCE by eliminating expensive heating coil replacements and upkeep. Its "give-and-take" ability abolishes costly heating system shut-downs necessitated by less flexible coils;
5. TRANSMISSION OF ALL EXTERNAL STRAINS to the casing is effected by "U" clip connections which securely hold the core in the casing, but allow
6. FREE EXPANSION OF ENTIRE CORE without distorting external casing;
7. PREVENTION OF EXTERNAL STRAIN, such as weight of connecting pipes, from being transmitted to the core;
8. YEARS OF CAREFREE OPERATION are possible with Aerofin Flexitube Heating Coils as a result of their scientific design, rugged construction, quality materials and craftsmanship.

AEROFIN CORPORATION

410 SOUTH GEDDES STREET • SYRACUSE, N. Y.

CHICAGO

DETROIT

NEW YORK

PHILADELPHIA

DALLAS

CLEVELAND

**Sell architects and owners
on the jobs you do with**

BETHLEHEM STEEL SHEETS



Stepped-up activity throughout the entire field of residential construction points the way toward a substantial increase in your own business. You'll find that right now is an excellent time to approach the architects, builders and home owners in your neighborhood, to sell them on sheet metal jobs with Bethlehem Steel Sheets.

You'll find it easy to convince prospects that steel is an ideal modern building material when you point out that it's strong, light, durable, firesafe and termite-proof. Here's a partial list of the many jobs you can

handle profitably with ductile, uniform Bethlehem Steel Sheets, black and galvanized:

Ductwork, Fire Doors, Flues, Furnace Pipe, Kick and Push Plates, Metal Ceilings, Partitions, Radiator Shields, Roofing and Siding, Table Tops, Ventilators, Window Sills and Frames.

Bethlehem Steel Sheets make good workmanship easier. They respond readily to bending, seaming, soldering, riveting and welding operations. They are uniform in quality, accurate in gage and size.



BETHLEHEM STEEL COMPANY

Build yourself a GOOD reputation

Specify

WISE FURNACES

*for AIR CONDITIONING
OR GRAVITY INSTALLATIONS*



A GOOD reputation is a mighty important part of your campaign when you're selling in a competitive market, and this one is no exception. It's up to you to make certain that all the gravity and air conditioning units you install perform with the utmost efficiency, economy and cleanliness. That's the way to start the ball rolling on high customer recommendations. A hard-to-get prospect is a cinch to sell if you can refer him to a satisfied customer.

The surest way to get a good reputation is to specify and install WISE Gravity or Air Conditioning units on every job. You'll find a complete line to choose from . . . a unit for any and every purpose . . . and at prices that will enable you to cope with competition.

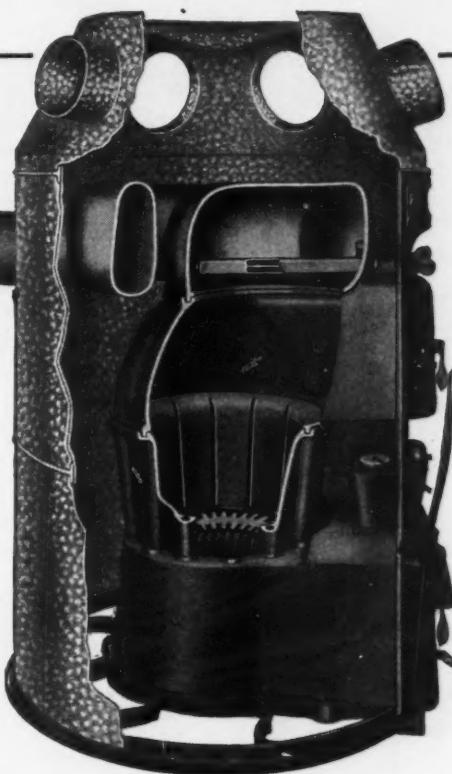
The air conditioning unit at left is a sample of WISE value. Modern, compact and highly efficient, you can depend on it to perform season after season with little, if any, servicing.

WISE GRAVITY FURNACE

HERE'S a furnace that will help you scoop the trade. A real performer and one that will get those hard-to-please customers. Just show them the NEW ONE-PIECE SELF-CLEANING RADIATOR that provides a larger combustion chamber and more prime heating surface . . . and which WILL NOT fill up with soot and dirt. The NEW ASHPIT AND LOWER FRONT, all in one piece to eliminate joints, and make installations easier . . . the ONE-PIECE CELLULAR FIREPOT, proved by university tests to be AT LEAST nine per cent more efficient than the solid type . . . the ONE-PIECE SQUARE BASE AND ENAMELED SQUARE CASING FOR AIR CONDITIONING USE that will fit in right up to snuff with any decorated basement.

You'll get many a replacement job this season . . . and be sure you protect the customer and the job by specifying and installing a MASTER Model A Wise Furnace.

Write Today for Literature!



WISE FURNACE COMPANY - AKRON, OHIO

"MY GROSS SALES VOLUME INCREASED
TENFOLD SINCE I STARTED WITH
Enduro Stainless Steel"

Years ago this man was a tinner. Today he is a businessman. What he has done, you, too, can do. Read, in his own words, the experience of M. J. (Mike) Cutter, Cutter Sheet Metal Manufacturing Company, St. Clair Ave., Cleveland, O., showing how he built a profitable business.

● "I started in business as a tinner in 1921 and struggled with run-of-mine jobs for several years. Then I decided to do something about the 'I eat you and you eat me competition.' In 1928 I found the answer—ENDURO* Stainless Steel.

"There was a very good reason for my move. Everyone told me that the metal was good, but too tough to work. That challenged me.

"I found that there are two requisites to the successful fabrication of stainless steel—proper shop equipment and the application of common sense. If a man can form ordinary sheet metal and has a head that he uses, he can form stainless steel. And that's no Pollyanna advice. I proved to my own satisfaction that the phrase 'Too hard to work' is all bosh.

"And believe me, my decision to jump into stainless steel work was a most profitable one. My gross volume in the last eleven years has increased ten times, and stainless represents 75% of my business. Since 1921 my average working force has jumped from one to twenty-five workers.

"When I tell you that my specialty is restaurant equipment, you will understand why I like ENDURO Stainless Steel, because in this work appearance is of prime importance, and the beauty that ENDURO brings to any job is a big help in selling it.

"Today there are greater opportunities in stainless steel than ever before. I would advise any tinner who is interested in cracking this business to concentrate on industrial plants in his territory. There are many common sheet metal applications in plants, such as drip pans, hoods, etc., that represent profitable work.

"And here is another tip to paste inside your hat. It won't be very long before stainless steel gutters and spouts will be a common sight.

"So my suggestion to any sheet metal contractor who wants to make his business more profitable is to go hide in a corner for a couple of days and study the market for stainless steel. Then beat the bushes and inform the world that you specialize in the fabrication of stainless steel. Pretty soon you'll discover, as I did, that the world will reverse the procedure of your beating the bushes and will start coming to you.

And when your customers start complimenting you on your work, you will begin to appreciate what a really wonderful metal ENDURO Stainless Steel is. The best insurance of my business is to hear a customer say, 'Mike, that's a swell job.'"

*Reg. U. S. Pat. Off.

REPUBLIC STEEL CORPORATION, Cleveland, Ohio

Please send me without charge a copy of "The Fabrication of ENDURO Stainless Steel."

Name.....

Company.....

Street..... City.....

BERGER MANUFACTURING DIVISION
NILES STEEL PRODUCTS DIVISION
STEEL AND TUBES DIVISION
UNION DRAWN STEEL DIVISION
TRUSCON STEEL COMPANY



American ARTISAN

Vol. 109

No. 4



Heating the Low Cost House

IN the Spring of 1938, commenting on President Roosevelt's then recent declaration that homes for persons of low income were badly needed, we stated that the idea, in theory, was excellent, but that house costs would have to be reduced if such persons could buy and, secondly, a desire for homes would have to be stimulated.

So far as we can judge, the desire for home ownership has not been stimulated, but remarkable changes have taken place in home building costs.

All over the country "low cost houses" have been offered to the public. In keeping with FHA's announced plan to popularize the house costing \$2,500 or less, thousands of these houses have been built. But not the hundreds of thousands which the nation visualized.

Is \$2,500 House Salable

The reasons for the failure to build or popularize houses costing \$2,500 is, we think, not too hard to find. The truth seems to be that in most parts of the country where heating is a major problem and the heating season longer than the summer season the \$2,500 house is not weather-tight enough nor comfortable enough.

Also, in most parts of the country where union labor predominates in new house construction, a house of any acceptable size or quality cannot be built at existing wage rates for \$2,500. Certainly not on the scale so far visualized by private builders.

And, lastly, in most parts of the country, the man of low income seems to be the man with larger than average or really large families and the \$2,500 house does not offer much in the way of plentiful space.

For the above simple reasons and for other reasons, probably, we are not building the \$2,500 houses in such quantities as FHA and our social services imagined.

Actually, the travels of the editors and field representatives of American Artisan indicate that

about the lowest cost house which can be sold runs from \$3,750 to \$4,990. Excepting in some localities where material or labor is abnormally high, this price range will build a very decent house. The house will contain a living room, kitchen, bath, one or two bed rooms downstairs and perhaps a very small dining room or dining alcove. Upstairs one room may be framed but not finished upstairs or there may be only an attic suitable for framing.

Most of these houses have central heating. A gravity furnace or a closet or utility room furnace may be used. For gravity furnace operation some basement is required. Where oil or gas are reasonable in cost, gas or oil firing is offered. Mechanical warm air is preferred and for sales appeal is offered wherever possible.

5% to 6% For Heating

However, investigation shows that even the cleverest systems using mechanical circulation cannot be installed under five to six per cent of the total cost of the house. For instance, in a house selling for \$4,500 and the house costing \$3,900, the heating system might install for \$200. It is difficult to see how a mechanical system can be installed for less. If there isn't five per cent in the cost for heating, then a gravity furnace is the answer if there is a basement—if not, then some form of floor furnace or circulating heater must be used.

So far as we can find, there is little sales appeal in the circulating heater. Probably because it is too much like the stove or heater the buyer had previously. Central heating, builders are finding, has a very definite sales appeal to the buyer.

Recently a large builder of \$4,500 houses was asked what appealed to the women and what appealed to the men. He said that the kitchen was the first thought of the women and the heating system the first thought of the men. Perhaps a national study would not disclose exactly the same reaction, but we feel the builder's answer is pretty near the truth.

The \$3,500 to \$4,500 house is a compromise. In its building certain things must be omitted or curtailed in favor of other features more necessary or more essential for sales appeal. And make no mistake, the \$4,000 house must have lots of sales appeal. It must, because to the family of low income \$4,000 is a tremendous purchase which must be paid monthly for ten, fifteen, even twenty years. The desire to own the house must be especially keen. Hence the very careful attention to salable features. If a feature is good but not definitely salable, such feature is apt to be discarded in favor of something else which can be sold.

Hence, we feel that it is particularly significant that the heating system is critically examined.

Savings Must Be in Installation

The problems of installing modern heating in these \$4,000 houses have been discussed before. The problem of developing suitable furnaces for this size and type of house has been energetically met by the manufacturers. But the problem of installing these units and reducing labor costs remains very much a problem. In several cities newspaper items report conferences between builders

and labor for the purpose of setting up two scales of wages. The going scale for large houses, industrial and commercial structures and a new and lower scale for low cost housing. How much progress has been made, we do not know, but the general idea seems excellent.

Unless labor scales can be reduced by some such agreement, the remaining possibility lies in cooperation between builder and heating contractor to perfect interior arrangements which lend themselves to simplified types of heat distribution—in other words a minimum amount of duct work and a minimum of expensive, intricate fittings. Remarkable innovations have been developed, but the ground has only been scratched. To be successful, such simplified systems will have to take full advantage of the knowledge we have of register types and characteristics; of plenum and supply pipe construction and air flow; of return systems which are short, simple, effective; of control operation in keeping with the simplicity of such houses.

That progress can be made has already been demonstrated, but farther progress is essential and can come only if the manufacturers, engineers and contractors pool our knowledge with the cooperation of the builder or owner.

Current Business Trends Will Be Published Quarterly

IN last month's issue the Department of Commerce monthly reports on sales of winter air conditioning, fans, oil burners and stokers, which have been running in chart form for some time in AMERICAN ARTISAN completed the statistics for the full year of 1939. Normally, these charts would appear in this issue with the January, 1940, figures and, perhaps, the February figures (the reports were usually issued about thirty days after the close of the month reviewed) and it would be possible to compare this 1940 period with the same one of the year before.

However, in the case of winter air conditioning and also of fans, the Department of Commerce, beginning with January, 1940, has changed its system of reporting monthly and has announced that hereafter there will be issued at the close of each

quarter reports on "Warm Air Furnaces, Winter Air Conditioning Systems and Accessory Equipment" and on "Blowers, Fans, Unit Heaters and Accessory Equipment." Thus, AMERICAN ARTISAN can not continue its monthly charts on these products. It will, however, be able to present this information quarterly and would like to ask its readers if they feel it will be of interest at such intervals.

Oil burners and stokers are still reported every month. There were 8,726 mechanical draft domestic oil burners sold in the United States in February of this year and 9,651 in January, a total of 18,377 for the two months. In the same two months of 1939 there were 12,161 sold. In the first two months of 1940 there were 6,261 residential stokers sold, compared with 4,983 in the first two months of 1939.

AMERICAN ARTISAN

RESIDENTIAL AIR CONDITIONING

SECTION



DEVOTED TO HOME AND SMALL COMMERCIAL AIR CONDITIONING



Pacific

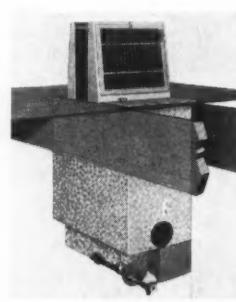
HUNTINGTON PARK, CALIF., APRIL, 1940

HERE'S YOUR 1940 PROFIT LEADER



Shipments of New Heat Exchangers Indicate Warm Welcome

Engineered for existing as well as new duct systems, Pacific's 1940 Heat Exchanger line is finding ready acceptance. A multi-tubular burner and element of highly efficient design heats and handles large volumes of air quickly and with notable economy and safety. Suitable sizes meet all commercial and industrial requirements.



Sensational New Floor Furnace Merchandising Set - Up Hailed!

A hundred percent effective new merchandising plan extends the field and zooms profits for dealers handling Pacific Floor Furnaces in 1940. It provides the equivalent of 300 Furnaces from a stock of just 10 Furnaces (4 floor, 3 single wall, 3 dual register); plus 10 Control Combinations (standard interchangeable A.G.A. Certified manual and thermostatic controls); and 3 Burner Assemblies (for natural, manufactured, and liquefied pe-

troleum gas fuels). The Furnaces embody latest designs and features such as die-formed heating element and multi-tubular burner, and are engineered for greater efficiency, economy and safety

New Central Heating Set-Up Gives Pacific Dealers Complete Market Coverage

A WIDE RANGE OF TYPES AND SIZES IN NATURAL, MANUFACTURED AND L.P.G. MODELS

Whatever your warm air heating and ventilating requirements, Pacific has the answer—the most complete line of highly specialized and "market proven" equipment in the field today! The items illustrated on this page are but a small cross-section of the various types, models and sizes available. Write today for complete information. Attractive discounts on samples. Don't wait—investigate!



Blower Furnaces and Forced-Air Units Predominate



"Air Conditioning" . . . the New Saleswo

When it is pointed out that forced-air heating is not only more efficient and satisfactory, but that the same equipment provides ventilation for comfort in summer, prospects for lower priced units are often converted to the Pacific Winter-Summer

Air-Conditioner. The "last word" in automatic units, it is fully closed, completely equipped. Special round element with cast-iron liner and multi-tubular burner and quiet blower are features. Electric panel board simplifies control hook-up.

"Closet" or On - Floor Unit



Pipe connections only are required for installation of Pacific Forced-Air high capacity furnace that is so compact

Ideal Replacement

This is the Blower Furnace to specify for low ceiling jobs. Good looking, flexible, low cost. Round heating element; cast-iron firebox liner. A favorite with installers and contractors.



will fit into a closet. Fully automatic; quiet and efficient. All sizes. Complies with latest A.G.A. Approval requirements.



PACIFIC GAS RADIATOR CO.
MAIN OFFICE AND FACTORY
HUNTINGTON PARK • CALIFORNIA



The Line of Least Resistance

DEALER

Write for 150-page catalog describing our complete line of furnaces, space heaters, water heaters and allied items. Valuable territory still open. Write or wire . . . NOW!

You take the low—

We'll Take the High Register Outlets

By F. R. Beebe

Manager, Heating Division, U. N. Roberts Corp., Davenport, Iowa

IN justice to thousands of contented home owners, the writer cannot permit Mr. Schwartz's condemnation of high side wall registers in the December, 1939, issue of the *Artisan* to go unchallenged.

Mr. Schwartz presented a case about as remote from a representative house-heating job as possible, and built up his defense of baseboard (or perhaps floor) supply outlets around this freak. While no dimensions or structural features were submitted, we accept the outlet and inlet locations where shown as logical, considering the inherent limitations and peculiarities of the building. And, accepting it as such, it shouldn't take a second glance to see that the scarcity of inlets and outlets, necessitating such long air travels, fairly SCREAMS for low outlets with low velocities, and as high C.F.M. as consistent with the desired number of air changes and register air temperatures. Mr. Schwartz takes well deserved credit for revamping this job from high side wall to low supply outlets. On the other hand, he exposed poor judgment in using this as a representative job to tear down high registers in general.

There are thousands of high grade heating and designing engineers in the world. Some prefer low supply outlets, while others prefer high side wall, or perhaps ceiling outlets. We would most certainly lose faith in the profession, if we felt that these men of science were so completely biased that they would throw common sense to the four winds in favor of some pet illogical theory. It is only good heating practice for the engineer to consider each job as an individual problem. If the job is workable with two or more different schemes (and most of them are), then is the time to express a preference.

We Find High Outlets Satisfactory

In the last five years we have installed about two hundred residential winter air conditioning systems in our Tri-City area. Approximately one-fourth of that number have overhead registers. To be sure, we have had a lot of headaches from both high and low, but every headache represented valuable experience as well as information, which today has enabled us to tackle any job, confident that the finished job will at least approach the expectancy.

Strangely enough, and in contrast to Mr. Schwartz's experience, our percentage of headaches with overhead supply outlets has been relatively small. While the percentage of our overhead installations might not indicate it, we prefer this type of air delivery, because we know from experience that we are offering the last word in comfort, convenience and practicability.

We have experimented in detail with the physiological requirements of mechanically circulated air, as applied to residential winter air conditioning, and our findings have led us to certain general applications that prove satisfactory.

High Outlet Fundamentals

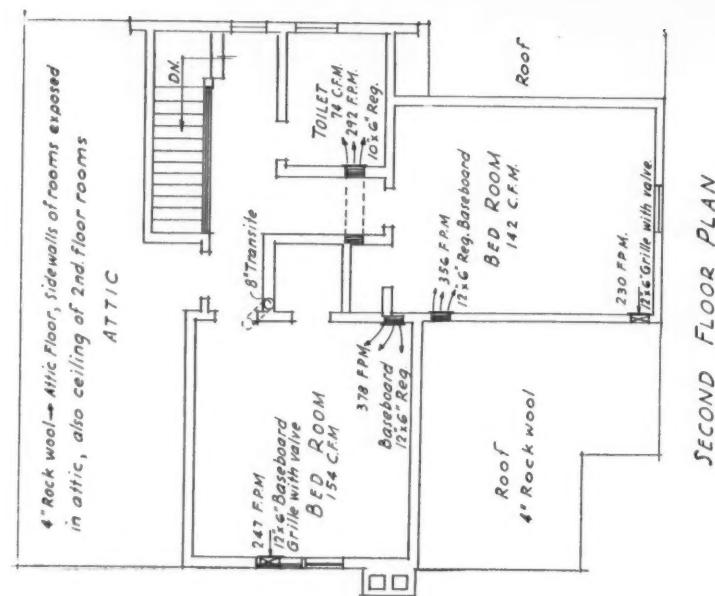
In the first place we very seldom attempt to heat a volume of more than 1,500 cu. ft. with only one supply outlet, regardless of the room heat loss. In general, the overhead supply face should be directed toward and parallel to outside walls in so far as possible. Register faces should be just slightly above the occupancy zone, and never more than seven feet above the finished floor. Faces should be equipped with four way vanes and valves to direct the flow of air as desired. Air deflection is vitally important in eliminating highly localized velocities. Proper deflection is not only the answer to "streaking," but it insures uniform distribution of air. Our scheme is to divert the air stream slightly downward with the valves, and deflect the horizontal throw in any and all directions depending on the requirements of the occupancy zone.

Return Air Locations

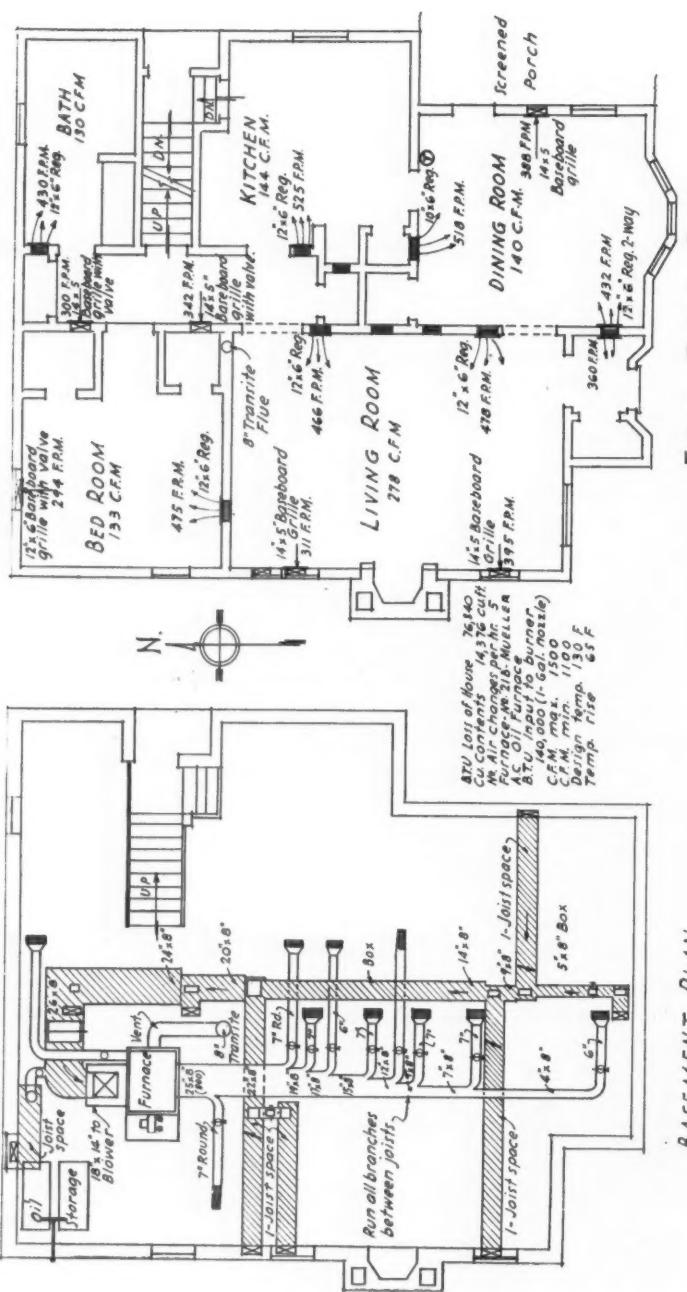
Our designs call for a return inlet to every supply outlet, except kitchens, baths and garages, with special attention to halls, stairwells and vestibules, where additional supplies and returns might be required to equalize the distribution of air. We have used both of the popular locations, for return air, i.e.:

1. On the same wall beneath the outlets at the floor.
2. Opposite the supply outlets across the room, on exposed walls, if possible.

Sometimes we used a combination of both, as may be seen on the accompanying plans. However,



SECOND FLOOR PLAN



FIRST FLOOR PLAN

we prefer arrangement 2 because the shorter air travel permits the use of lower velocities. We seldom have occasion to use face velocities over 500 F.P.M. even at horizontal throws of fourteen feet. Impact on the opposite wall is undesirable and unnecessary even in the U scheme of air travel. However, we have found that higher velocities are required in the U travel, sometimes as high as 700 F.P.M. for good distribution, especially if the outlets are over seven feet above the floor. But here again is the danger of producing noticeable air currents in the occupancy zone in the heating season, which, on the other hand would be desirable for hot weather operation.

We Avoid "Short Cut" Design

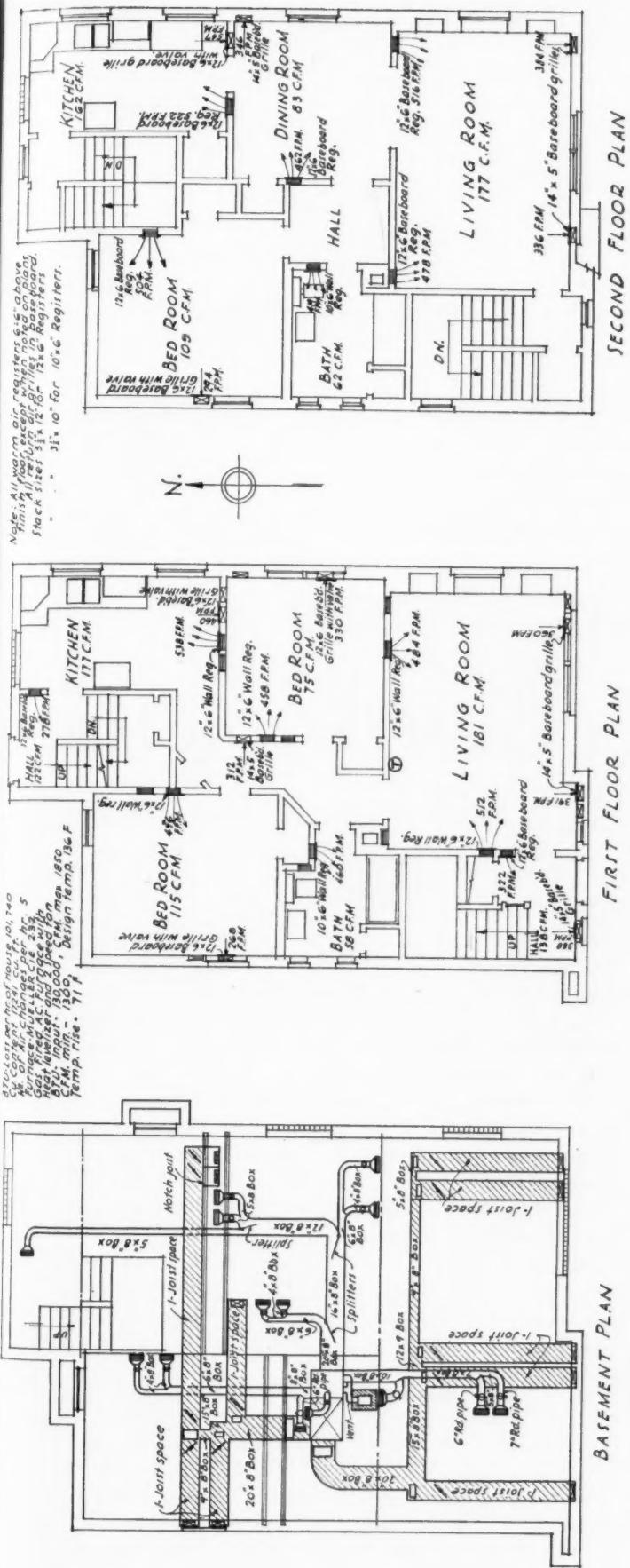
We take pride in our jobs and use extreme care in designing our plants. All of our calculations are made the "Hard Way." We do not recognize any short cut, cut and dried, or rule of thumb methods of calculating the health and comfort requirements of our customers. We leave those to the many curbstone heating merchants who so brazenly abuse such a worthy scientific development as is this new and important industry known as Air Conditioning. Most of these merchants are misled by careless equipment manufacturers who are more interested in marketing their products than in the promotion of the industry. They have no knowledge of the Technical Code. They don't know a B.T.U. from a load of hay, much less being able to figure heat losses. And if their lives depended on calculating the relation between heat loss, register air temperature, number of air changes, and C.F.M. and the resultant areas so definitely dependent upon accurate C.F.M. calculations and relative velocities, they wouldn't be worth a Tinker's Dam.

Two Typical Job Results

The mechanical circulation of air is a fascinating study, and we are constantly endeavoring to improve our forced air technique. If we feel that auxiliary equipment, or gadgets, improve the system we do not hesitate to include them in our estimates. Two-speed motors, throttling fuel devices, clock thermostats, time switches, zoning devices, controlled humidity, etc., all are important contributions to the Better Heating System.

The return duct system must needs be more or less fragmentary in character, consequently more flexibility is permitted, than in the design of the all important supply system. For instance, our return inlet velocities may be reduced up to 50 per cent of the kindred supply outlet. Valves or dampers are used in the return faces in sleeping rooms, and kitchens too, if they require a return. We have also found that building up a slight room static pressure is a satisfactory means of guarding against the infiltration of cold air.

A few weeks ago, about the time the writer read Mr. Schwartz's discussion, we balanced the gas fired job in the duplex shown on the accompanying plan. It was a timely yet random opportunity to



The plan above shows the two-apartment installation described in the text where high side wall registers, adequate dampering, careful location of supplies and returns provided uniform temperatures throughout both floors. The floor plan preceding shows the installation in the home of a highly satisfied owner who "demanded" high registers from experience.

check Mr. Schwartz's theories. Both apartments had been occupied a few days with the plant running wild. The job had been installed in accordance with our preferred theories, with the supply outlets 6 feet 6 inches above the floor throughout, except the front and rear entryways. The thermostat is four feet above the finished floor in the first floor living room as shown.

Balancing Procedure

One of our first steps in balancing a job is to approach the tenant with questions about temperatures, drafts, etc., in short, we are interested in "Effective Temperature."

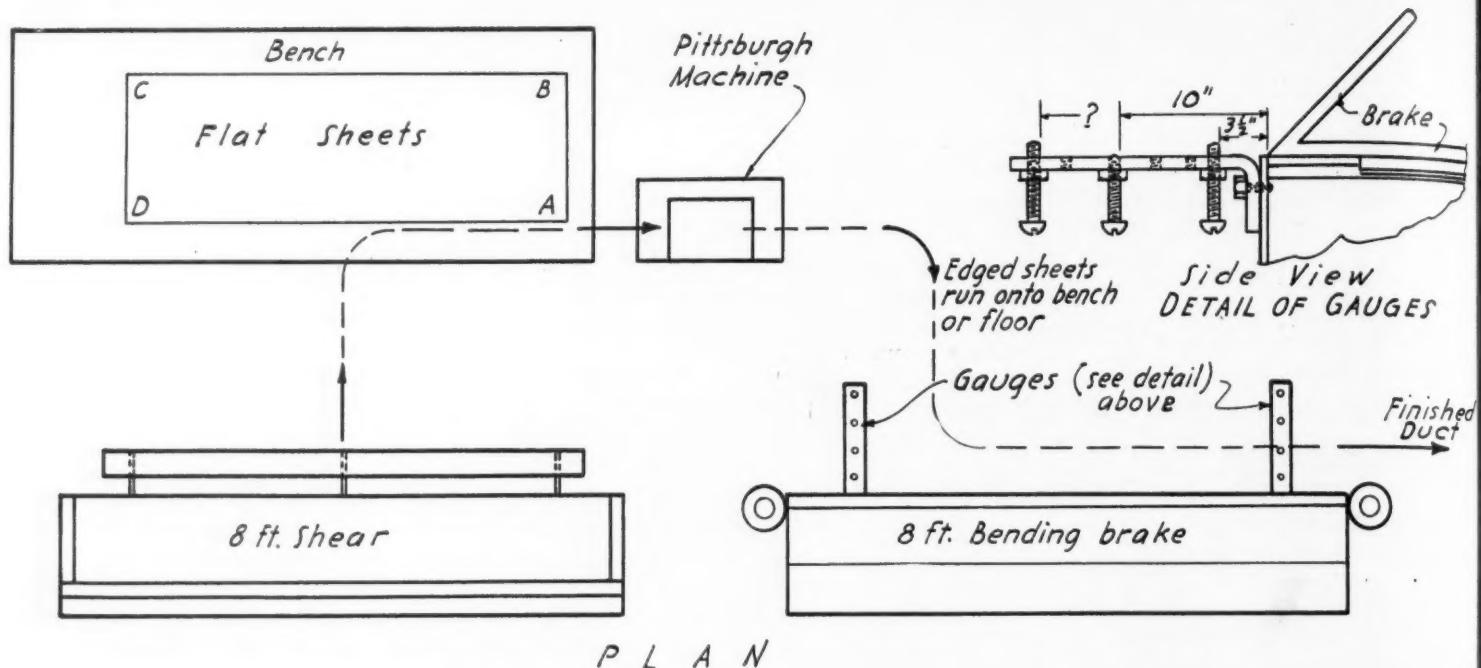
In this case we found that with the thermostat set at 75 F. the first floor bath was cold and the northwest bedroom was overheated, and the second floor bedroom was cold. Outside of a heat pocket in the first floor living room together with the foregoing, both tenants agreed that the balance of the house was fairly comfortable. We then proceeded to make our adjustments involving the usual routine of checking burner input and bonnet temperatures, adjusting dampers, velocities, humidity, fan speed, room temperature, etc. Incidentally, we are quite liberal in the application of dampers on both the supply and return lines, as can be seen on our plans. Having overheated the house by having the burners on too long, we decided to wait a day or two to check for effective temperatures.

On our second call we found both tenants agreeably pleased with our heat balance. After a few minor adjustments at the register faces we proceeded to take our temperature readings. The temperature at the thermostat was 75 F. (desired on account of two small children on the first floor) and we checked temperatures in the living room in detail because it is large and well exposed. The temperature on the inside wall in the vicinity of the thermostat one foot above the floor was $73\frac{1}{2}$ F. The reading on the carpet at the east end of the room two feet in from the south wall was 72 F. The other end of the room in the same relative position near the door was $70\frac{1}{2}$ F. The center of the room one foot above the floor was 74 F. and directly above this point at the breathing line was 76 F. One foot from the ceiling in the center of the room was $77\frac{1}{2}$ F.

After this we checked all parts of the occupancy zone in each room at the waist line with the dry bulb of a sling psychrometer, and the maximum variations on the first floor ranged between 72 F. and 76 F. The second floor range was between 71 F. and 74 F. throughout with the bathroom at 78 F. Anemometer readings were inserted on the tracings and can be seen on the accompanying plans. No drafts nor cold stratifications were noticeable.

There is nothing remarkable about the other plan shown, although it does present a few unique features. It is a joy to design and install a job like this because the simplicity of room arrangement makes for a pleasing streamlined duct system. In-

(Continued on page 48)



How We Cut Duct Labor Costs 80%-or More!

By Thomas W. Crockett, Jr.

WE save, a conservative estimate shows, from 2,500 to 5,000 man hours of shop labor per year by the method of making ducts described here.

Having no delusions about being a second "Henry Ford," I still think "ideas" are the most valuable commodities in the world. Especially if we are to make "Winter Air Conditioning" available to the volume market, at a price people want to pay.

About two years ago, my company employed me as superintendent of its proposed sheet metal shop. My first job was to get the machinery and benches laid out for production. The next job was to train a lot of inexperienced men to produce the ducts and fittings needed. It was also necessary to do a great deal of coaching with the draftsmen in order to get a more efficient and economical duct job layout and coordinate office and shop production. Previously the company had sub-contracted the sheet metal and duct work, but found the costs higher than most customers wanted to pay.

Stock Fittings First Step

Our method has been to work out a system of stock fittings and duct sections that will take care of a great portion of our requirements and be ready at a moment's notice for shipment to the job.

We work an early and late shift in the shop. The installation crews returning in the afternoon, bring

a list and sketches of special fittings needed to clear obstacles created by other trades, or due to mistakes, changes or re-routing of ducts. The late shift's first duty is to make up these special orders, to be ready and waiting for the installation crews the following morning.

The secret of our growth, I feel confident, is—managing officers of the firm who are open minded and receptive to new ideas; team work and a fine degree of co-operation between the various departments; an aggressive sales organization; supervising engineers who visit the jobs in progress and iron out all difficulties; labor saving tools and machinery in the shop; a tailor-made, streamlined, neat looking duct job; giving the best service we know how to give the customer.

Standard Wall Stock Sizes

When I took charge of the sheet metal shop about two years ago, the company was selling around fifty residential, winter air conditioning jobs a year. Since then they have sold almost 1,700 jobs, plus a few commercial installations, such as restaurant and hotel jobs, using the methods described as follows:

Comparing our method with that of other shops I find that we save 80 per cent or more on labor costs.

This method of making ducts in one-fifth or less

of the time usually required applies mainly to wall stack in 8-foot lengths and 8x3½, 10x3½, 12x3½, 13½x3½-inch sizes. This 13½x3½-inch size may seem a little odd, but we encountered so many tight spaces in houses due to studs and framing being staggered or off center that we discarded the 14x3½-inch size.

We often use this method on basement trunk ducts, especially on a group of houses in one contract, with the same floor plan.

Buy Sheets Cut to Exact Size

First—The galvanized sheets are bought in exact sizes needed, and run through the Pittsburgh or corner lock machine without shearing. This saves time and a lot of wasted scrap. We use 24x96, 28x96, 32x96, 35x96 sheets for wall stack. We find our cost per pound to be the same as regular stock sheets that have to be trimmed but we have no waste.

Second—We usually place several hundred galvanized sheets on the bench (see Fig. 1 drawing) snip off corner "A" (see detail in Fig. 2), start the sheet through the Pittsburgh lock forming machine and, as the sheets glide by, hand snip corners B, C, D, on the fly. Repeat the operation, etc. One, proficient workman can keep sheets coming through like link sausages.

Gauges Make Brake Semi-Automatic

Third—The sheets are now in the right position to slide into the brake, where two men work together. For instance, on 10x3½-inch duct, a ¼-inch edge is turned up, using the ¼-inch brake blade as a gauge. Next, jerk the sheet out to the 10-inch gauge pin, bend up; push in to 3½-inch gauge, bend up; jerk it out to the 10-inch gauge pin again, bend up. Our men average bending two, and on occasional spurts, three to four complete, eight-foot lengths of duct per minute.

Fourth—The duct is left unseamed. In this way the duct is easily nested together (see Fig. 3) taking less space for loading in the delivery truck, or storage.

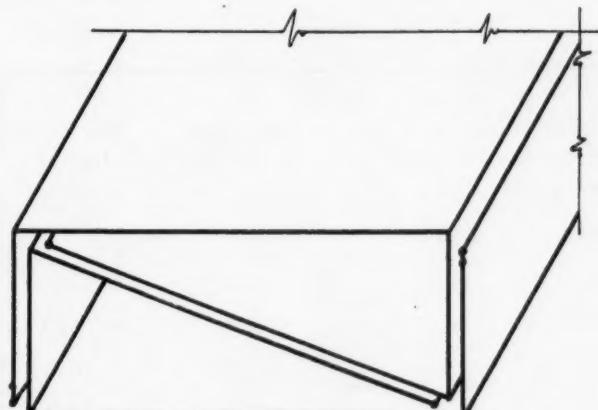


Fig. 3 Nesting duct for storing or shipping.

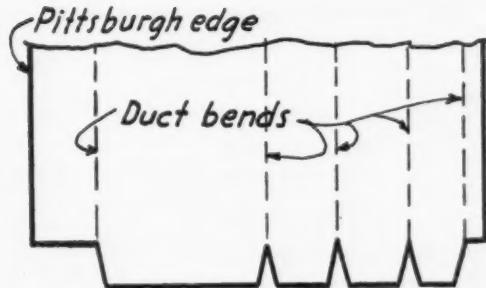


Fig. 2.—The old method of marking sheets for the brake required measuring, prick marking, notching each end where the bends are to come. Also juggling in the brake to line up the prick marks. Incidentally, trimming the ends of the sheets on the job often wastes the labor of notching, anyhow.

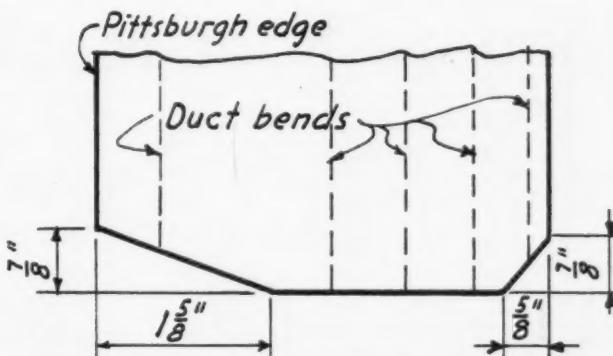


Fig. 2.—The new streamlined method described here uses the gauges which eliminate measuring, prick marking, notching and all juggling. Also much handling and re-handling. The corners are snipped approximately as shown.

Another advantage is that unseamed duct is more easily and quickly cut to fit, on the job.

Formerly we used a double lock and seaming rail in the shop, but now find the Pittsburgh or corner lock forming machine much faster and more economical.

Fifth—the backbone of this system are gauges, which I made from scrap lying around the shop, as follows (see detail in fig. 1).

Construction of Gauges

Take two lengths of flat bar steel or iron 2x1/4x19½ inches long, approximately. Bend up square about 2½ inches from end. Drill hole and fasten these to brake bending leaf, taking advantage of the threaded holes present in the machine. Then measure from the brake clamping blade to the various points desired for bends. At these points drill holes and tap threads to accommodate stove or machine bolts which act as stop pin gauges for any combination of duct bends.

Don't overlook the fact that even special sheets usually run about one-eighths inch larger than called for, and allow for this in marking the gauge bar. Occasionally you may find it necessary to insert a thin shim or washer between the gauge bar and brake to make the duct run out even.

FIGURE 1.

1 Branch	2 Room	3 CFM in Branch	4 Branch size	5 Total CFM for trunk	6 Trunk Size
1	Bed Room	132	9 x 4		
2	½ Living Room and Vestibule	148	9 x 4½	280	9 x 8
3	Dining Room	132	9 x 4	412	9 x 12
4	½ Living Room and Vestibule	148	9 x 4½	560	9 x 16
5	Kitchen	118	9 x 3½	678	9 x 20
6	Bed Room	124	9 x 4	802	9 x 24
7	Bath Room	58	9 x 3	860	9 x 25½
8	Bed Room	108	9 x 3½	968	9 x 29

"Square Foot Method" of Sizing Ducts

By Alfred R. Wagstaff

Engineer, Sioux City Fdy. and Boiler Co., Sioux City, Iowa

THE "square foot method" of sizing ducts is not new, it has been used for a long time and the simplicity of its operation makes it a favorite with many heating contractors. It should be understood, however, that this is really only a variation of the "velocity method."

This method is based on the fundamental formula:

$$\text{Area} = 144 \times \frac{\text{CFM}}{\text{FPM}}$$

Where area is the desired free area of the main or branch, CFM is the cubic feet per minute passing through the duct and FPM is the velocity in the main or branches, in feet per minute.

The best way to describe the use of the accompanying tables is to show the method of use in an example. First make a line layout of your job, locating all the outlets in their proper places with the CFM necessary at each outlet, and the location of the conditioning unit. Then make a schedule of the rooms according to their position on the layout, starting with the rooms farthest from the blower and listing the branch number, room name and the CFM requirements of each, as shown in columns 1, 2 and 3 of Fig. 1. For the capacity of the Main Trunk add the CFM of each branch to the previous branch and write down the totals, as shown in column 5. When through, the trunk and branches are ready to be sized, which is an easy matter.

Most heating contractors favor some arbitrary velocity in figuring their installations so for simplicity a velocity of 600 FPM will be used in this example, although this method will work alike on any velocity.

As shown by the formula, the CFM is divided by the velocity and the quotient multiplied by 144.

Turning to the example (Fig. 1), the main trunk can be sized first and then the branches. The sum of branches 1 and 2 is 280 CFM. Divide 280 by 600 which gives .467. This means that the pipe to carry 280 CFM at 600 FPM should have a free area of 46.7% of a square foot.

As all the tables are figured in square inches, the quotients obtained must be converted into square inches by means of Table 1. Referring to 47% of a square foot, the figure 67.7 is found or 47% of a square foot equals 67.7 square inches. This method is carried on for each of the totals. See Figure 2.

After the free areas are all tabulated, the duct sizes are obtained from Table 2. This is the table of equal friction of round and rectangular ducts which has been in use for a number of years by heating and ventilating engineers and was published in full in the Sept., 1937, issue.

FIGURE 2.

Percentage of square foot	Free area Sq. Inches	Duct size Inches
600)280(.467	67.7	9 x 8
600)412(.686	99.4	9 x 12
600)560(.930	133.9	9 x 16
600)678(1.13	162.7	9 x 20
600)802(1.34	193.0	9 x 24
600)860(1.43	205.9	9 x 25½
600)968(1.61	231.8	9 x 29
*	*	*

TABLE 1
 For Duct Areas
 Percentages of a Square Foot in Square Inches
 Compiled by Alfred R. Wagstaff, Sioux City, Iowa

%	Sq. In.	%	Sq. In.	%	Sq. In.	%	Sq. In.	%	Sq. In.	%	Sq. In.	%	Sq. In.	%	Sq. In.
1	1.44	51	73.4	101	145.4	151	217.4	201	289.4	251	361.4	301	433.4	351	505.4
2	2.88	52	74.9	102	146.9	152	218.9	202	290.9	252	362.9	302	434.9	352	506.9
3	4.32	53	76.3	103	148.3	153	220.3	203	292.3	253	364.3	303	436.3	353	508.3
4	5.76	54	77.8	104	149.8	154	221.8	204	293.8	254	365.8	304	437.8	354	509.8
5	7.20	55	79.2	105	151.2	155	223.2	205	295.2	255	367.2	305	439.2	355	511.2
6	8.64	56	80.6	106	152.6	156	224.6	206	296.6	256	368.6	306	440.6	356	512.6
7	10.1	57	82.1	107	154.1	157	226.1	207	298.1	257	370.1	307	442.1	357	514.1
8	11.5	58	83.5	108	155.5	158	227.5	208	299.5	258	371.5	308	443.5	358	515.5
9	13.0	59	85.0	109	157.0	159	229.0	209	301.0	259	373.0	309	445.0	359	517.0
10	14.4	60	86.4	110	158.4	160	230.4	210	302.4	260	374.4	310	446.4	360	518.4
11	15.8	61	87.8	111	159.8	161	231.8	211	303.8	261	375.8	311	447.8	361	519.8
12	17.3	62	89.3	112	161.3	162	233.3	212	305.3	262	377.3	312	449.3	362	521.3
13	18.7	63	90.7	113	162.7	163	234.7	213	306.7	263	378.7	313	450.7	363	522.7
14	20.2	64	92.2	114	164.2	164	236.2	214	308.2	264	380.2	314	452.2	364	524.2
15	21.6	65	93.6	115	165.6	165	237.6	215	309.6	265	381.6	315	453.6	365	525.6
16	23.0	66	95.0	116	167.0	166	239.0	216	311.0	266	383.0	316	455.0	366	527.0
17	24.5	67	96.5	117	168.5	167	240.5	217	312.5	267	384.5	317	456.5	367	528.5
18	25.9	68	97.9	118	169.9	168	241.9	218	313.9	268	385.9	318	457.9	368	529.9
19	27.4	69	99.4	119	171.4	169	243.4	219	315.4	269	387.4	319	459.4	369	531.4
20	28.8	70	100.8	120	172.8	173	244.8	220	316.8	270	388.8	320	460.8	370	532.8
21	30.2	71	102.2	121	174.2	171	246.2	221	318.2	271	390.2	321	462.2	371	534.2
22	31.7	72	103.7	122	175.7	172	247.7	222	319.7	272	391.7	322	463.7	372	535.7
23	33.1	73	105.1	123	177.1	173	249.1	223	321.1	273	393.1	323	465.1	373	537.1
24	34.6	74	106.6	124	178.6	174	250.6	224	322.6	274	394.6	324	466.6	374	538.6
25	36.0	75	108.0	125	180.0	175	252.0	225	324.0	275	396.0	325	468.0	375	540.0
26	37.4	76	109.4	126	181.4	176	253.4	226	325.4	276	397.4	326	469.4	376	541.4
27	38.9	77	110.9	127	182.9	177	254.9	227	326.9	277	398.9	327	470.9	377	542.9
28	40.3	78	112.3	128	184.3	178	256.3	228	328.3	278	400.3	328	472.3	378	544.3
29	41.8	79	113.8	129	185.8	179	257.8	229	329.8	279	401.8	329	473.8	379	545.8
30	43.2	80	115.2	130	187.2	180	259.2	230	331.2	280	403.2	330	475.2	380	547.2
31	44.6	81	116.6	131	188.6	181	260.6	231	332.6	281	404.6	331	476.6	381	548.6
32	46.1	82	118.1	132	190.1	182	262.1	232	334.1	282	406.1	332	478.1	382	550.1
33	47.5	83	119.5	133	191.5	183	263.5	233	335.5	283	407.5	333	479.5	383	551.5
34	49.0	84	121.0	134	193.0	184	265.0	234	337.0	284	409.0	334	481.0	384	553.0
35	50.4	85	122.4	135	194.4	185	266.4	235	338.4	285	410.4	335	482.4	385	554.4
36	51.8	86	123.8	136	195.8	186	267.8	236	339.8	286	411.8	336	483.8	386	555.8
37	53.3	87	125.3	137	197.3	187	269.3	237	341.3	287	413.3	337	485.3	387	557.3
38	54.7	88	126.7	138	198.7	188	270.7	238	342.7	288	414.7	338	486.7	388	558.7
39	56.2	89	128.2	139	200.2	189	272.2	239	344.2	289	416.2	339	488.2	389	560.2
40	57.6	90	129.6	140	201.6	190	273.6	240	345.6	290	417.6	340	489.6	390	561.6
41	59.0	91	131.0	141	203.0	191	275.0	241	347.0	291	419.0	341	491.0	391	563.0
42	60.5	92	132.5	142	204.5	192	276.5	242	348.5	292	420.5	342	492.5	392	564.5
43	61.9	93	133.9	143	205.9	193	277.9	243	349.9	293	421.9	343	493.9	393	565.9
44	63.4	94	135.4	144	207.4	194	279.4	244	351.4	294	423.4	344	495.4	394	567.4
45	64.8	95	136.8	145	208.8	195	280.8	245	352.8	295	424.8	345	496.8	395	568.8
46	66.2	96	138.2	146	210.2	196	282.2	246	354.2	296	426.2	346	498.2	396	570.2
47	67.7	97	139.7	147	211.7	197	283.7	247	355.7	297	427.7	347	499.7	397	571.7
48	69.1	98	141.1	148	213.1	198	285.1	248	357.1	298	429.1	348	501.1	398	573.1
49	70.6	99	142.6	149	214.6	199	286.6	249	358.6	299	430.6	349	502.6	399	574.6
50	72.0	100	144.0	150	216.0	200	288.0	250	360.0	300	432.0	350	504.0	400	576.0

To use this precalculated table first divide the CFM of the register by the velocity of the serving pipe and obtain a percentage of a square foot. It may be more than one square foot in the main trunk. Locate this percentage in the table above and read the number of square inches of area required. Then convert this area (in square inches) to rectangular duct dimensions maintaining the selected depth of duct.

TABLE 2

EQUIVALENT ROUND AND RECTANGULAR DUCTS FOR EQUAL FRICTION AND AREAS OF ROUND DUCTS

Size of Rect. Duct	2½	3	3½	4	4½	5	6	7	8	9	10	11	12	13	14	15	16
DIAMETER AND AREA OF EQUIVALENT ROUND PIPE																	
8	4.7	5.2	5.7	6.1	6.5	6.9	7.6	8.2	8.8	...	...	...	...	...	...	...	...
	17.3	21.3	25.5	29.2	33.2	37.4	45.4	52.8	60.8	...	...	...	...	...	...	...	...
8½	4.9	5.4	5.9	6.3	6.7	7.1	7.8	8.5	9.1	9.6	...	...	...	...	...	...	...
	18.9	22.9	27.3	31.2	35.3	39.6	47.8	56.7	65.0	72.4	...	...	...	...	...	...	...
9	5.0	5.5	6.0	6.5	6.9	7.3	8.0	8.7	9.3	9.9	...	...	...	...	...	...	...
	19.6	23.8	28.3	33.2	37.4	41.9	50.3	59.4	67.9	77.0	...	...	...	...	...	...	...
9½	5.1	5.7	6.2	6.6	7.1	7.5	8.2	8.9	9.6	10.2	10.7	...	...	...	...	...	...
	20.4	25.5	30.2	34.2	39.6	44.2	52.8	62.2	72.4	81.7	89.9	...	...	...	...	...	...
10	5.2	5.8	6.3	6.8	7.2	7.7	8.4	9.2	9.8	10.4	11.0	...	...	...	...	...	...
	21.3	26.4	31.2	36.3	40.7	46.6	55.4	66.5	75.4	84.9	95.0	...	...	...	...	...	...
10½	5.4	5.9	6.5	7.0	7.4	7.8	8.6	9.4	10.0	10.7	11.3	11.8	...	...	...	...	...
	22.9	27.3	33.2	38.5	43.0	47.8	58.1	69.4	78.5	89.9	100.3	109.4	...	...	...	...	...
11	5.5	6.0	6.6	7.1	7.6	8.0	8.8	9.6	10.2	10.9	11.5	12.1	12.6	...	...	...	...
	23.8	28.3	34.2	39.6	45.4	50.3	60.8	72.4	81.7	93.3	103.9	115.0	124.7	...	...	...	...
11½	5.6	6.2	6.7	7.2	7.7	8.2	9.0	9.8	10.5	11.2	11.8	12.4	12.9	13.4	...	...	...
	24.6	30.2	35.3	40.7	46.6	52.8	63.6	75.4	86.6	98.5	109.4	120.8	130.7	141.0	...	...	...
12	5.7	6.3	6.9	7.4	7.9	8.3	9.2	10.0	10.7	11.4	12.0	12.6	13.2	13.7	...	...	...
	25.5	31.2	37.4	43.0	49.0	54.1	66.5	78.5	89.9	102.1	113.1	124.7	136.8	147.4	...	...	...
12½	5.8	6.4	7.0	7.5	8.0	8.5	9.4	10.2	10.9	11.6	12.2	12.9	13.5	14.0	...	...	...
	26.4	32.2	38.5	44.2	50.3	56.7	69.4	81.7	93.3	105.7	116.9	130.7	143.1	153.9	...	...	...
13	5.9	6.5	7.1	7.7	8.2	8.7	9.6	10.4	11.1	11.8	12.5	13.1	13.7	14.3	...	...	...
	27.3	33.2	39.6	46.6	52.8	59.4	72.4	84.9	96.8	109.4	122.7	134.8	147.4	160.6	...	...	...

Part of table of round (diameter) and rectangular (square inches) ducts for equal friction. Full tables published in Sept., 1937 Artisan. Contractors not familiar with these tables and wishing copies should write to the editors for source of supply.

Decide on one depth of duct to be used in the particular job being figured, taking into consideration the depth of the beams, joists, etc. In this instance 9 inches will be used. Glancing down the vertical 9-inch column (Table 2) the figure 67.7 is not found so that the left duct size column is selected and glancing to the right along the 9 inch horizontal line 67.9 is found, the nearest number to 67.7. The heading of this vertical column is 8 inches, so the farthest part of the main will be 9 x 8 inches to supply branches 1 and 2.

The next section of the main which includes branch 3 requires a capacity of 412 CFM and the

previous operation is again carried out, except the vertical column headed 9 inches is used. The nearest figure to 99.4 is 102.1. The figure in the left hand column is 12 inches or the main is 9 x 12 at this section.

Continue in this manner for the entire job, as shown in Fig. 1, for the main and the branches. When completed, the work sheet will be as in Fig. 1. The branches were sized using the 9-inch index from the left side of Table 2 while the main was sized using the 9-inch index at the top.

The above method also saves time in the shop when making up the ducts for a job.

We'll Take High Register Outlets

(Continued from page 43)

cidentally this is the fourth house for the same man in which we have designed and installed the heating, in the last five years. The first house had baseboard supply registers. The last three have overhead registers by demand. There must be some good reason for this decided choice for overhead registers.

The writer spent the evening with this man and his wife early this week, and it was most flattering to see how enthusiastic they were over the heating plant. We occupied most of the time making a few adjustments and playing around with the anemometer and psychrometer. There are no children and it was decided that a thermostat setting of 72 F. with a variation range of from 70 F. in the first floor bedroom to 74 F. in the living room was satisfactory for day time and evening operation. Every nook and corner of that house was comfortable. It is quite interesting as well as enlightening to watch the gentle deflection, diffusion and final disbursement of cigarette smoke in an atmosphere of this kind when puffs are released in the vicinity of

the outlets and inlets and at various points in the occupancy zone, to remind us that the air movement must be close to the theoretically correct 25 to 40 F.P.M. in the rest zone.

Future Cooling and Furniture Problems

We all have a lot to learn about this thing called Air Conditioning. It involves much more than the simple mechanical circulation or movement of air. If the experience of some leads them to prefer low supply outlets we say, "More power to them." On the other hand others find that high side wall registers create an atmosphere of Spring with only a gentle movement of air throughout the occupancy zone in contrast to the noticeable blasts from low registers. These advocates of overhead outlets, too, have foreseen that there is always a possibility of subsequent application of cooling which would not be successful with low outlets. And last, but not least, the engineer has complete control of the job. He doesn't have to battle Mrs. Home Owner about register locations. She can have every inch of all four walls if she wants it. When the whole thing is added up, and conditions permit, there doesn't seem to be much choice in our opinion, so we'll take the High Side Wall Registers.

Factors Which Effect Stoker Satisfaction

By G. C. Ziliotto

WE LIKE to think that a stoker can burn any kind of coal and, what is remarkable, is that it comes very near to doing so. However, particularly in the small sizes used in residential heating plants, it will pay to burn a good grade of coal especially prepared for stoker firing.

A good stoker coal should first of all be screened to the proper size with regard to the diameter of the feed worm. The smallest size feed worm is ordinarily three inches (or slightly under) in diameter, and since the core is about $\frac{3}{4}$ inch in diameter, it follows that the maximum size of the coal lumps should be one inch, and preferably $\frac{3}{4}$ of an inch. If larger lumps are used the feed worm will crush them and produce a great amount of fines and noise.

Between one quarter and one third fines mixed with the lumps is not objectionable and, if the stoker is not equipped with a smoke-back preventer, this amount is useful in sealing the coal feed tube. However, with some kinds of coal that have a tendency to cake, the presence of fines tends to aggravate this condition which may result in smoke coming back through the coal tube and the coal in the hopper. Reducing the amount of air supplied by the blower, after cleaning the pot thoroughly of any clinkers formed on it, will often remedy this trouble because the lower rate of combustion will allow the green coal to rise over the top of the retort and to burn above it instead of down in it. When too much air is blown in for the amount of coal fed, the coal burns in the retort with intense heat. The molten clinker tends to seal the top of the retort and by the intense heat over it force the volatiles being liberated from the green coal back into the coal feed tube. If the draft can be increased, this also will help toward preventing the smoke-back nuisance.

Effect of Too Much "Fines"

Too much fines, especially if wet, have a tendency to produce arching of the coal in the hopper, that is, formation of a cavity just above the feed worm so that no coal can be fed to the retort. With a hopper designed funnel shaped and quite narrow at the base, this trouble was more common than with the modern hopper which has vertical sides, or sides very little slanting in. The funnel shaped hopper tended to pack the coal as it moved downward toward the feed worm because of its narrowing horizontal sections and, besides, the slanting sides provided an excellent support for the arch. Agitators were often employed to stir the coal in the hopper and prevent arching, but today they are not usually employed. The arching of the coal in

the hopper not only stops the feeding of coal to the retort, but causes smoke-back, because an empty coal feed tube provides a clear passage for the gases of combustion back to the hopper.

As on top of the retort there is always a layer of plastic coal (see Fig. 2) or plastic clinker, which creates a resistance to the flow of the air into the fire-box, this air mixed with volatiles and smoke is forced back to the hopper through the feed tube. If the natural draft created by the chimney is

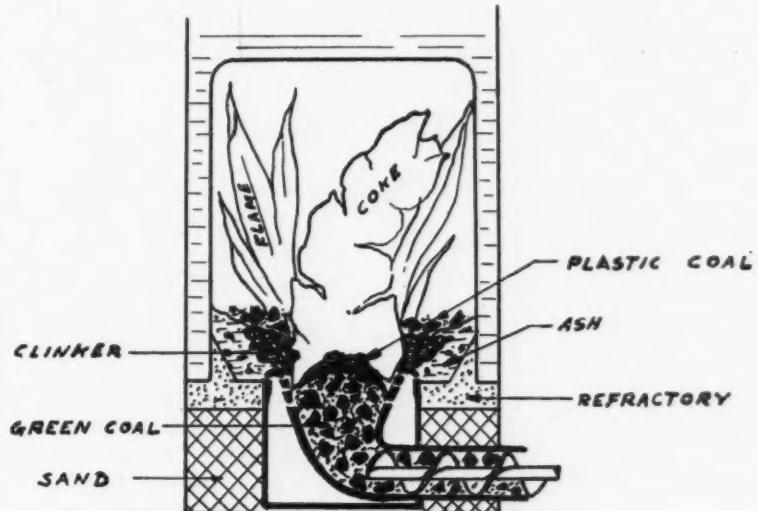


Fig. 2—Coke "trees" in a retort

strong enough to overcome this resistance, then the tendency of the air to flow into the feed tube will be nullified, and, conversely, the weaker the draft the greater will be the tendency of the air to exit via the feed tube.

Another contributing cause to the smoke-back nuisance is a too great percentage of ash content in the coal. Ashes are a valuable element in the operation of a stoker because by their presence they protect the tuyeres and dead plates from too high a temperature and quick deterioration. To perform this service they should have a melting point not lower than about 2400 F., otherwise they slag too easily. On the other hand their melting point should not be too high, say above 2600 F., otherwise, in some cases, they will not clinker at all. The temperature in the fuel bed is not uniform; on the contrary, there are zones in which the temperature reaches as high as from 2600 to 3200 F. depending on the size of the stoker and the efficiency of combustion. In these zones clinkers will form, while in other zones ashes will not clinker. As we have said, it is necessary to have both ashes and clinkers for good performance, the

first for the reason given above and the clinkers for convenience in cleaning the fire. If no clinkers are formed when a coal having a high ash content is burned, we will have to take out shovelfuls of ashes every day, which is both wasteful and inconvenient.

Stoker coal should have an ash content of not less than 4 per cent and not more than 10 per cent. This last figure is high for the average small stoker as this amount of ashes will tend to smother a small fire whether they remain in the original state or become clinkers. In the latter event smoke-back trouble is very likely to occur in spite of everything we can do.

If too many ashes are found in the fuel bed so that it becomes necessary to remove them, the trouble may not necessarily be due to the quality of the coal. Sometimes a change from the type of installation shown in Figure 1-A to the type shown in Fig 1-B will remedy the condition. This last type tends to concentrate the heat over and immediately around the retort; the higher temperature created and the fact that the ashes cannot spread far away from this zone of high temperature will tend to melt them into clinkers.

Coking Coal Problems

Coal having strong coking characteristics is not necessarily objectionable in stoker firing if the stoker is designed for burning such type of coal. With most stokers, however, a strong coking coal is often troublesome to burn, particularly when a tree-like formation of solid coke is formed deep in the retort and shoots up as shown in Figure 2. When such condition obtains and the coke tree is well embedded in the retort, it tends to grow to large proportions without breaking up. Thus there is little chance for the air to penetrate and burn it and, when eventually it breaks up, too much coke accumulates above the retort. If the characteristics of the blower are such that the amount of air delivered decreases rapidly with an increase in the pressure against which it has to deliver, then a shortage of air is likely to occur and more coal will accumulate above the retort, until, in extreme cases and during long periods of stoker operation, the whole combustion chamber will be filled. Such a situation indicates that the stoker is not designed for burning strongly coking coal, and usually the best policy is to try a different type of coal.

Volatile Amounts Important

The amount of volatile, that is, hydrogen, oxygen, nitrogen, and carbon vapor which the coal gives out when heated, is also an important factor in successful burning by stoker firing. A high grade bituminous coal may contain as much as 40 per cent volatile, but 25 to 35 per cent is satisfactory. A coal having this amount of volatile is called free burning. A chemical analysis of coal cannot settle the question of whether the coal is suited for stoker firing, but can only furnish comparative data and some indication of its suitability. In general, only experience can tell whether the coal is suitable

or not, but before condemning it we should make sure that the fault is not with our installation if not with the stoker.

It will pay the conscientious stoker dealer to carry out his own experiments, making changes *one at a time* so that the information will be definite.

Stoker Firing Efficiency

Stoker firing is inherently more efficient than hand firing for two reasons: First, because combustion is more nearly perfect in the sense that less volatile leaves the heater unburned and no solid fuel is wasted in the form of ashes and unburned coal mixed with them which, in hand firing, have to be removed. Second, because combustion takes place at a higher temperature due to a more positive supply and control of air, better mixing of air with the gases of combustion, and a more concen-

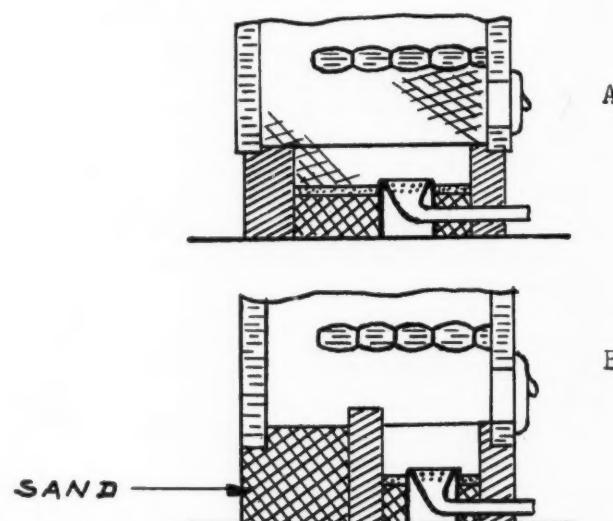


Fig. 1—Fire Box Design

trated fire. A higher combustion temperature means higher heater efficiency for the same rate of firing.

There are other reasons why stoker firing is ordinarily more efficient than hand firing. However, these are not inherent in the method but rather contingent on the human element. If hand firing were done expertly it could be nearly as efficient as stoker firing, but in ordinary practice, especially in residential heating or small commercial plants, firing is done in a haphazard way. Coal is piled up on the grates as high as possible in order to reduce the frequency of attendance to the fire, with the result that combustion is poor for lack of sufficient air and of combustion volume on top of the fire. Unburned gases and smoke escape through the chimney in large quantities, while some time later when the fuel bed has become too thin, an excessive amount of air is drawn through the fuel bed and reduces the efficiency of the heater.

We can conclude from theoretical considerations and practical experience that stoker firing is in general more efficient. This, however, does not mean that the *overall* efficiency of stoker-heater operation is always more efficient irrespective of the relative

capacity at which the heater is operated. The efficiency of a heater is not a fixed quantity, but varies with the amount of heat that is supplied to it. As we increase the rate of firing from the minimum that can be maintained, the efficiency of the heater increases quite rapidly at first, then gradually levels off until, if we increase still further the rate of firing, we notice that the efficiency drops, at first slowly and then more rapidly (see Fig. 3) until a point is reached beyond which any attempt to increase the rate of firing will not produce an increase in the output of the heater.

Determining Heat or Capacity

The capacity of a heater is an undetermined quantity that really has no meaning until we specify the firing rate or the efficiency at which that capacity is obtained. If we want to determine the comparative efficiency of stoker firing versus hand firing in a given heater, we should first establish the output that it is required to give and then measure the amount of coal burned per hour in order to maintain that output by hand firing and by stoker firing. The ratio between the Btu delivered by the heater and the Btu available in the weight of coal burned per hour is the overall efficiency of the heater. The efficiency of a stoker-fired heater will be found to be generally greater than that of the same heater when hand-fired and delivering the same amount of heat, which means that to develop the same capacity we shall need to burn less coal with stoker than with hand firing. If, on the other hand, we require the heater to develop a greater capacity when stoker-fired than when hand-fired, then we have an entirely new condition.

To increase the capacity of the stoker-fired heater we shall have to increase the firing rate and we have seen that the efficiency will change with the

amount of coal burned per hour. As we keep increasing the firing rate, the efficiency will begin to decrease in a stoker-fired, as well as in a hand-fired heater and eventually we may reach a rate at which the efficiency of the stoker-fired heater is lower than the overall efficiency of the same heater when hand-fired at a lower rate of firing. When this condition is reached no saving in fuel is possible while the heater is fired at this higher rate.

We have shown this condition in Fig. 3 in which an efficiency and a firing rate curve for a stoker-fired and for a hand-fired heater are plotted on an output basis. These curves are not taken from actual tests and are given only as an illustration of the general behavior to be expected in regard to the overall efficiency and firing rate for different outputs of a heater. If, in average cold weather, the heater has to deliver 300,000 Btu per hour at the outlet and when stoker-fired it has to deliver (during the operating periods) 500,000 Btu per hour, we find from our graph that the hand firing efficiency was 67%, while the stoker firing efficiency at 500,000 Btu capacity is only 61%. A ratio of 500,000 is only 1.66 of the hand-fired capacity and

300,000 therefore the rate of stoker firing is not beyond what it would be in actual practice.

If we regard our efficiency curves as representative of actual test results with a specific heater, then we conclude that stoker firing will be less efficient than hand firing under the conditions described. On the other hand, the graph makes clear that if the capacity of the boiler is kept at 300,000 Btu per hour when stoker-fired, then its efficiency will rise from 67% to 71%.

In mild weather, if the hand-fired heater is required to supply only about 100,000 Btu per hour

(Continued on page 76)

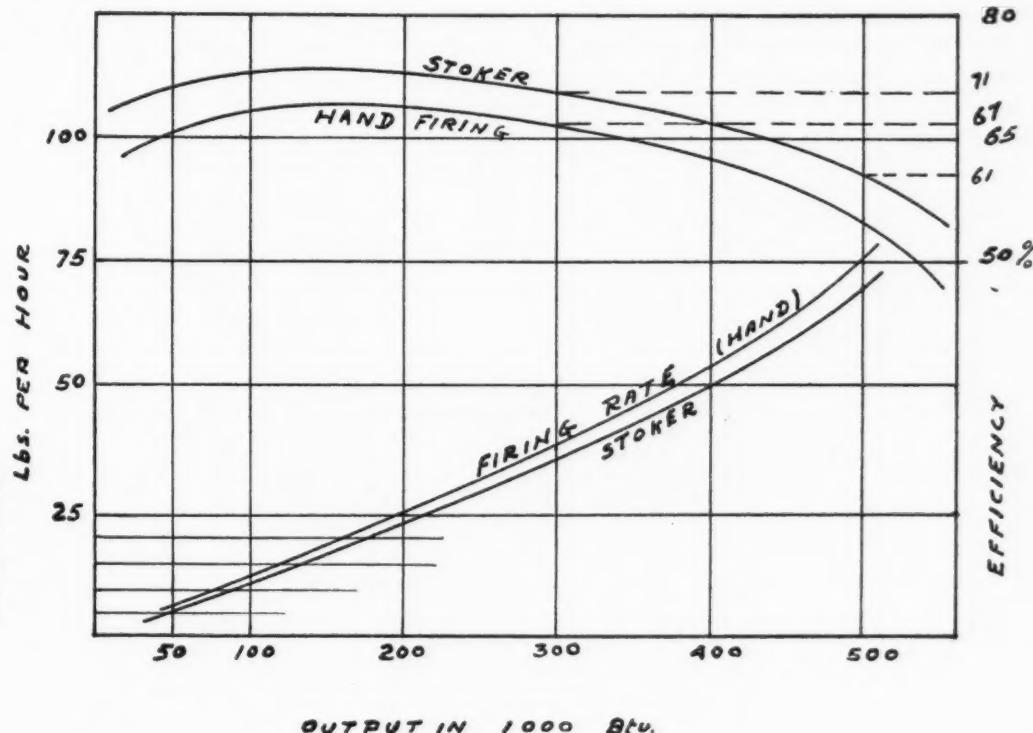


Fig. 3

Actual test data plotted to show efficiency in per cent and consumption in pounds per hour between hand firing and stoker firing. The stoker increases efficiency in both cases.

Method For Determining Heat Losses Without Any Mathematical Calculations

By F. W. Skinner

Arlington, New Jersey

I HAVE followed Mr. Voorhees articles in your magazine closely and believe no one who is familiar with figuring heat losses would have difficulty in following his tables. Most of Mr. Voorhees tables are based on a temperature difference of 70 deg. This is fine as far as it goes and he shows how other values can be obtained by percentages or by interpolation.

I agree with Mr. Voorhees that there is a need for some simple method for finding heat loss values. One that could be used by any, or all, furnace contractors. In my opinion, for a table to be of any use to a heating contractor, long multiplications, percentages, or interpolation **MUST** be eliminated.

I have worked up a table and heat loss sheet which I feel has some definite advantages. The "Key Sheet" shown is the foundation. Perhaps an example will give an idea how it works out. It is necessary to have a calculation sheet so the Btu values could be placed in proper order. It is also necessary for the operator to have the ASHVE GUIDE in order to select the correct coefficients.

Example

Adjoining a living room there is a garage. The walls are built of 8 in. hollow cinder concrete block, cores are filled with granulated cork, plaster on wood lath, furred (room side). Size of living room 10 x 12 x 8, two sides exposed, having 1 in. wood siding, clapboard, 4 in. stud space, $\frac{3}{4}$ -in. plaster on

metal lath on studs, no insulation between studs. Space above fully heated.

The floor is maple on yellow pine sub floor on joists, 1 in. rigid insulation, $\frac{1}{2}$ in. plaster, no insulation between joists. Space under the living room is tightly inclosed. No heat. Ground tem. taken as 25 deg.

Two 2'-8" x 4'-6" D. H. sash. Single thickness glass. West side fitted with storm sash (suspended).

One D. H. sash, S. T. glass, no storm sash on south side.

Garage heated to 50 deg.

Living room = 75 deg.

Outside tem. = -10 deg.

The key sheet is filled in as follows:

Lines 1 to 5 are self explanatory.

Line 9 equals 176 sq. ft. of exposed wall and 96 sq. ft. of garage wall. Set these in lines 9 and 21 and 19.

Two windows with storm sash. One without. Coefficients from GUIDE (Table 13) are .45 and 1.13 respectively.

A window of this size shown above has 12 sq. ft. of area and a perimeter of 17 lin. ft. each, by calculation.

Set these in lines 10 and 12.

Exposed wall = 176 - 36 = 140 sq. ft., coeff. from GUIDE = .26.

Garage wall = 96 - 0 = 96 sq. ft., coeff. from GUIDE = .17.

(Text continued on page 60)

Select Coeff. From Guide	Temp. Difference	Sq. Ft. →	Sample of "Multiplication Table" Covering Heat Loss For, Roof—Ceiling—Wall—Floor—Glass—Doors—and Perim. With Coeff. Range From .10 to 1.26 and Temp. Difference From 32° to -20° Between Inside and Outside																							
			1	2	3	4	5	6	7	8	9	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
.14	50	→	7	14	21	28	35	42	49	56	63	70	140	210	280	350	420	490	560	630	700	770	840	910	980	1050
.17	25		4	9	13	17	21	26	30	34	38	43	85	128	170	213	255	298	340	383	425	468	510	553	595	638
.26	85		22	44	66	88	111	133	155	177	199	221	442	663	884	1105	1326	1547	1768	1989	2210	2431	2652	2873	3094	3315
.45	85		38	77	115	153	191	230	268	306	344	383	765	1148	1530	1913	2295	2678	3060	3443	3825	4208	4590	4972	5355	5737
.68	85	B. T. U.	58	116	173	231	289	347	405	462	520	578	1156	1734	2312	2890	3468	4046	4624	5202	5780	6358	6936	7514	8092	8670
.71	85		60	121	181	241	302	362	422	483	543	604	1207	1811	2414	3018	3621	4225	4828	5432	6035	6639	7242	7845	8449	9052
1.13	85		96	192	288	384	480	576	672	768	864	961	1421	2882	3842	4803	5763	6724	7684	8645	9605	10566	11526	12487	13447	14408

— HOW TO APPLY TABLE —

In above problem, the net exposed wall is 140^{□'}. For this construction Guide calls for .26. Follow down line of Coeff. at left side of Table till .26 is reached. For a Temp. Difference of 85° on same line under 140^{□'} find 3094 B.T.U. exact.

For adjoining garage wall, net 96^{□'}. For this construction Guide gives .17, again follow line of Coeff. till .17 is reached for a Temp. Difference of 25°. Along the same line under 90^{□'} find 383 and under 6^{□'} find 26, total 409.

For windows or doors. Follow line of D. H. sash sizes (not shown) until 2'-8" x 4'-6" is reached. Read direct 12^{□'} and Perim. of 17 Lin. Ft. In 15 M. wind Guide gives .68 and .71. In same manner as above read direct Heat Loss for windows and Perim.

KEY SHEET

Item	Room Number		101	101 A
	Room Use		Living	Total
	Room Bas'mt. 1st. Fl., 2nd. Fl. etc.		1st. Fl.	
1 Room	Size (w - L - H)		10x12x8	Btu
2 Room	Cu. ft. (W x L x H)		960	for
3 Room	Fl. Sq. ft (L x W)		120	each
4 Room	Temp. Customers Desire		75°	room
5 Register temp. (Optional)			115°	
6 Wall	Gross sq. ft. (outside) Bas'mt. above grade			
7	Glass and doors sq. ft.			
8 "	Net			
9 Wall	Gross sq. ft. (Outside) all above bas'mt.		176	
10	Glass and doors sq. ft.	24 12 1.13x85	918 1153	
11 "	Net	.26x85		3094
12	Perimeter Crackage Lin. ft. (G and D)	17 34 .71x85 .68x85	1026 1965	
13	Sum of exposed surfaces, (wall G and D) Line 6 to 12			8156
14	Exposure Direction 15 M Wind add %	W 15%		1223
15	Sum of Lines 13 and 14			9379
16 Wall	Gross sq. ft. Bas'mt. (Below Grade)			
17	Glass and Doors Sq. ft.			
18 "	Net			
19 Wall	Gross Sq. Ft. (inside) adjoining partly heated space		96	
20	Glass and doors sq. ft.	0		
21 "	Net	.17x25		408
22 Floor	Bas'mt. or over partly heated space. or fully exposed.	120 .14x50		840
23 Ceiling	or roof			
24 Btu	Total for each room (15 to 23 inc.)			10627
25 Cfm	For each room (Btu x .020 = cfm)			212

A balancing procedure which will **Adjust the System to the Owner's Satisfaction**

By Mitchel Landau

MANY customers expect a modern winter air conditioning system to do things never even conceived possible of older heating systems. Some of this expectation is due to the vast amount of premature publicity given to air conditioning; some of it is due to overselling the various benefits of air conditioning. Also, it is possible that the system does not function as represented because no one can possibly install a system that will function in actual operation exactly as conceived.

While heating contractors are now able to design and install winter air conditioning systems in accordance with the new codes of the National Warm Air Heating and Air Conditioning Association, as well as from many years experience in heating and ventilating work, they should also be able to *balance* the winter air conditioning system to satisfy the customer. No matter how carefully and accurately designed and installed, every system requires adjusting and balancing.

There often are physical changes in the average home for which no provision was made in the original heat loss calculations. For instance, the infiltration factor must be arbitrarily assumed, because no one can determine in advance the average width of the crack in windows and doors or estimate the relative looseness or tightness of the sash, upon which the loss factor is predicated. Most of these factors are also based on 15 miles per hour wind velocity, while actually the wind velocity is never constant. Rooms with an excessive amount of glass exposure will react unfavorably on the occupants, due to the high radiation losses from the body to the cold walls. The age and health of the people in the home is an important factor which cannot be calculated in the original design data.

The psychological angle is becoming more understandable to engineers because of research investigation. Here is an example. If you are supplying a large quantity of low temperature air at

slow speed, your customer may think the system is inferior to a gravity job. On the other hand, a small quantity of hot air at high speed may feel cool to the customer regardless of the actual higher temperature of the air. Then, also, many customers cannot be convinced that the *feeling* of comfort in the room is paramount and that this feeling does not necessarily bear any relation to the sequence of fan operation and the resulting periods when air may or may not be pouring out of the registers. Usually, the customer goes to the register every time to test the supply by hand, regardless of the room air condition.

It seems obvious that the object of balancing is to make the system provide what the customer thought he bought from the salesman at the time the order was signed. They probably did not discuss Btu's, C.F.M.'s, and other technicalities very extensively. The customer wants, and the salesman promised, heat throughout the entire building at a uniform temperature, this to be furnished economically. Further, the customer was probably promised freedom from all care and worry about the heating plant. The customer expects his humidifier to function without attention by him and the air in

his home to be properly conditioned for winter comfort. The system must be balanced to the satisfaction of the customer, and the job must be re-sold, no matter how perfectly it may seem to be working to the engineer. The salesman who made the original sale can do the re-selling, but if the engineer who balances the system explains its operation it is more convincing and final.

Balance Carefully

First, all apparatus in the system should be checked to see if it is operating according to the design data. Apparatus should then be readjusted to overcome specific customer objections, regardless of what the design calculations specify; the original figures acting only as a guide.



The author takes a CO₂ reading with a special portable instrument with direct reading dial.

The actual work of adjusting and balancing depends upon the training and experience of the contractor or engineer as well as the instruments he has at his disposal. The author will explain his procedure and the instruments he uses. These need not be followed exactly, as the reader may have other preferences, but the underlying principles for securing proper balance remain the same. Choose your own type of instruments as long as you get the desired results.

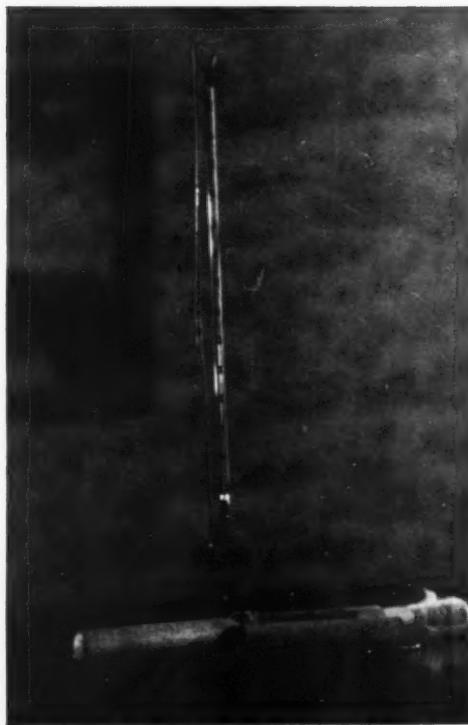
Let us follow through a typical example. The heat loss was calculated and the layout made according to the Technical Code for the Installation of Forced Warm Air Heating Systems. The installation of the system was completed yesterday.

Writer's Balancing Methods

Place a thermometer in each room of the house. If incorrectly done this exceedingly simple step may complicate any balancing which may be necessary. The thermometer itself should be large enough to read clearly. It should have one degree calibrations engraved on the glass itself, be filled with mercury (not alcohol) and be large enough for the customer to read clearly. (It should be unmounted —no backing of any kind.) It should also be of the total immersion type.

Do not place the thermometer on a table or hang in on a wall, as this will cause an inaccurate reading because of the temperature of the object with which it is in contact or near. It should be placed at or near the center of each room at the same height in each room and hung from a stand which suspends it in midair so that surrounding objects will not affect the indication of the exact temperature of the air around the thermometer.

While the thermometers are becoming adjusted to the individual room air temperature, we may work in the basement. Before going down, reset the thermostat one or two degrees higher to put the automatic heating equipment into operation but not enough to disturb the normal operation of the system. Before the house comes up to the new



The author's thermometer stand (which can be placed anywhere in the room) is made from stiff wire and the complete unit comes apart for carrying in the tube.

thermostat setting, you may test the CO_2 , draft, and stack temperature.

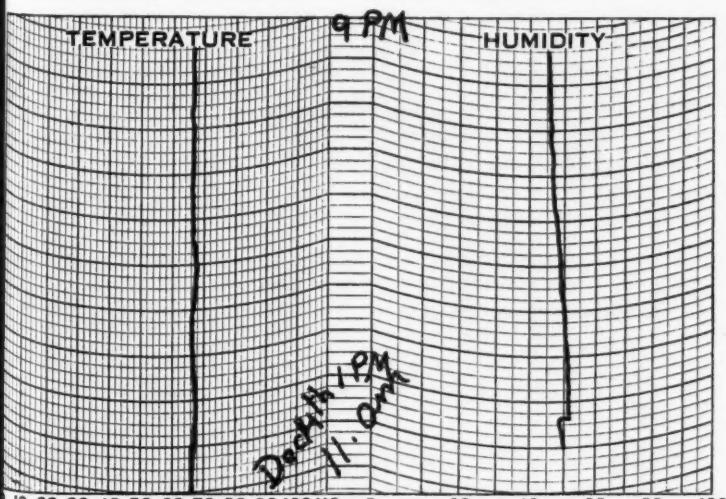
Many types of equipment are available for making these tests. All of them give essentially the same results from a practical standpoint, and that is what we are interested in. Be sure, however, that your instruments are accurately adjusted and calibrated. If you have a direct reading CO_2 instrument it should be checked once or twice a year for accuracy.

Stack Temperature and CO_2

Punch a hole in the smokepipe a short distance from the furnace; make it just large enough to insert your Pitot tube and thermometer. This hole should be between the furnace and the draft stabilizer—not between stabilizer and chimney. Insert the thermometer and watch until its highest temperature is reached. Make a record of this temperature. Now, insert the draft tube in the same opening and check the condition of the draft, making a record of the pressure reading. Finally, insert the sampling tube of your CO_2 instrument.

Another method is to use a direct reading instrument which indicates two or all three readings at the same time. If you use an Orsat, be sure that the solution is fresh and change it often enough to obtain accurate results. If you use a direct reading (Wheatstone Bridge Instrument) check it occasionally for accuracy of calibration.

We shall not enter into a discussion of combustion efficiency. The combustion should be checked and adjusted to obtain the highest efficiency. It is our duty to the customer to see that fuel is not unnecessarily wasted.



The temperature and humidity recorder should be used to check systems while the plant is establishing equilibrium and to check owner's statement of conditions.

By this time our room thermometers should be up to temperature. (Keep a record of your work and make it orderly. You will be able to read it years later if you follow a definite procedure.) Read the temperature at the control system thermostat first. Record both the thermostat setting and the reading of the thermometer on the thermostat, if it has one. Then read the temperature of the thermometer in the center of the room. Write all these down.

Determine Actual CFM

As quickly as possible, in like manner, record the temperature in the center of each room. Then make a record of the average velocity at each grill. An anemometer or a velometer will serve your purpose. With either instrument you may secure the average velocity by checking 6, 9, or more points on the grille, depending on its size. A rough average velocity may be determined by sweeping the instrument across the grille, close to the face. Record the size of the grille next to the reading taken. The manufacturer's catalogue will give you the free area in square feet, or this may be approximated by a correction factor .6 or .75—depending on type of grille used.

The square inches of free area times the F.P.M. divided by 144 equals C.F.M. The sum of these readings provides a check on whether the fan is delivering enough or too much air, as well as an indication of the design balance and for record in later balancing.

Temperature is Final Criterion

The final results are to be judged by the thermometer readings only. If these are fairly close it may be unnecessary to adjust dampers. If some rooms are too warm and others too cold, then adjustments must be made. Place your velometer (if this is the instrument that you use) at a point indicating average velocity in the warmest rooms. Have an assistant in the basement close the damper until the velocity is cut down to approximately the desired point. This point will depend on how much warmer the room is than it should be, how much higher the velocity is than required, and the register temperature.

Wait for the System to Stabilize

After the warmer rooms are throttled down, a period of adjustment should be allowed. During this time the controls should not be changed. If the operation cycles on and off, it should be permitted to do so.

In about 15 or 20 minutes the thermometers should be checked again. If any further adjustments are required, they should be made. This procedure is repeated until all room thermometers

Residence at Marion Square Rd.

Date of Balancing—11/14/39 & 11/15/39

Draft	Flue Temp.	CO ₂	Thermo. Set
.04	550°	11.5%	69°
1st. Reading	11/14	2nd. Reading	11/14
Reg. Room	Reg. Room	Reg. Room	Reg. Room
Reg. FPM. Temp.	FPM. Temp.	Reg. FPM. Temp.	FPM. Temp.
L. R. No. 1 700 69.5	L. R. No. 1 600 70	L. R. No. 1 600 71	L. R. No. 1 600 71
L. R. No. 2 550 ..	L. R. No. 2 600 ..	L. R. No. 2 600 ..	L. R. No. 2 600 ..
Hall 800 70.5	Hall 650 71	Hall—1 600 72	Hall—1 600 72
D. R. No. 1 1000 72.0	D. R. No. 1 750 74	D. R. No. 1 500 73	D. R. No. 1 500 73
D. R. No. 2 850 ..	D. R. No. 2 700 ..	D. R. No. 2 550 73	D. R. No. 2 550 73
Study No. 1 600 68.0	Study No. 1 650 69	Study No. 1 650 70	Study No. 1 650 70
Study No. 2 450 ..	Study No. 2 600 ..	Study No. 2 650 ..	Study No. 2 650 ..
B. R. "A" 1 500 69.0	B. R. "A" 1 700 69	B. R. "A" 1 700 71	B. R. "A" 1 700 71
B. R. "A" 2 700 ..	B. R. "A" 2 700 ..	B. R. "A" 2 750 71	B. R. "A" 2 750 71
B. R. "B" 450 68.0	B. R. "B" 650 69	B. R. "B" 650 71	B. R. "B" 650 71
B. R. "C" 600 71.0	B. R. "C" 600 70	B. R. "C" 600 72	B. R. "C" 600 72
B. R. "D" 1 500 66.0	B. R. "D" 1 650 66	B. R. "D" 1 750 69	B. R. "D" 1 750 69
B. R. "D" 2 320 ..	B. R. "D" 2 550 ..	B. R. "D" 2 800 69	B. R. "D" 2 800 69
Hall 950 73.0	Hall 700 72	Hall 2 500 72	Hall 2 500 72

Keeping a record of conditions is as important as taking the readings. The author enters a job like this on a small notebook sheet. Note how the balance was secured in three adjustments.

record almost alike. A maximum differential of 4 degrees and an average differential of 2 degrees is an indication of a well-balanced installation.

When this is done, have the customer read the thermometers during your last trip around. Show him how carefully you checked the heating of the building, how accurately you balanced the system. Point out any unusual conditions which may exist, such as excessive glass exposure, cold floors over open porches, and so forth.

Explain to the customer what the system is doing for him, not how it works. Impress him with the fact that when the home is comfortable at a certain thermostat setting, he should leave the thermostat alone and not attempt to run the heating system manually by setting the thermostat up and down all the time.

Final Checkup

Go back the next day for a final check-up. Make a complete record including outside temperatures. Check all windows and window frames. Use the velometer to test leaks around doors and point these out to the customer. Make sure your customer understands that you cannot keep a house uniformly warm with open windows or doors, and if there is any great amount of leakage such condition is equivalent to open windows and doors. It is up to the home owner to correct this condition.

The degree of satisfaction your customer will enjoy will be in direct proportion to the thoroughness with which you balance the job. The amount of balancing required will be inversely proportional to the accuracy of design and installation.

The problems of balancing are always open to improvement unless the contractor follows a definite procedure. This article, and the articles on pages 57 and 49, suggest a number of practical balancing methods worked out by contractors for all types heat supply. It is interesting to note that all three authors balance the system for comfort first and to precalculated requirements secondarily.

Thermo. Se	69°
Reg. Room	
PM. Temp	
600	71
600	71
600	72
500	73
550	73
650	70
650	70
700	71
750	71
650	71
600	72
750	69
800	69
500	72

Suggested Procedure To Balance An Oil-Fired Air Conditioning System

By E. F. Fuller

E. F. Fuller Engineering Co.
Nashotah, Wisc.

IN order to balance any air conditioning job, it is first necessary to understand the design features of the system. Usually, the design is based primarily on theoretical data, this theoretical data authenticated, for the most part, by laboratory tests and during the actual operation of systems after installation.

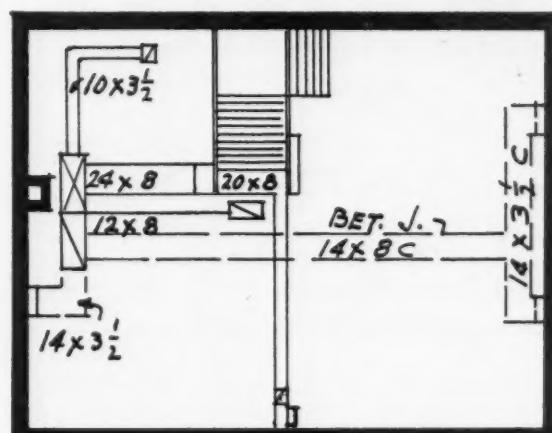
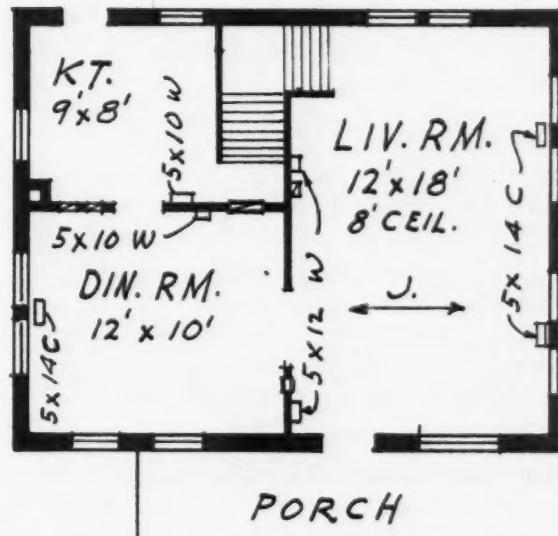
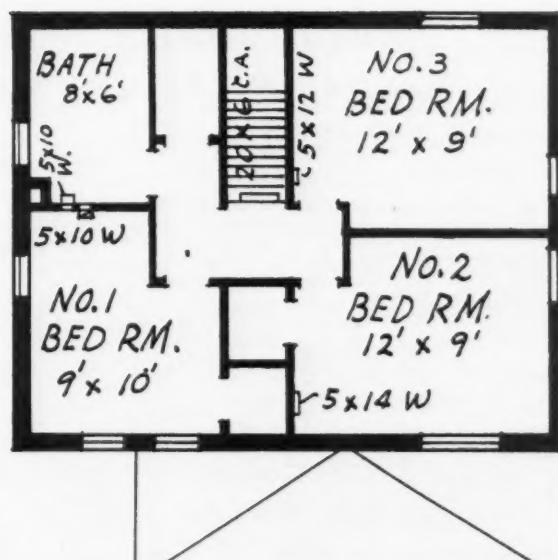
Since rectangular ducts are used almost exclusively in modern systems, this discussion will be confined to specifications which recommend nothing smaller than $3\frac{1}{2} \times 10$ risers and 5×10 registers, and nothing larger than $3\frac{1}{2} \times 14$ risers and 5×14 registers in the ordinary residence job.

Duct Design Affects Balancing

There is, at present, two schools of thought as to the construction of ducts and fittings. One group insists on quadrant dampers in all trunk lines and branches to regulate the air flow at the take off for each riser; the second group advocates dampers in register stack heads only. Both these groups use a design factor based on a fixed register temperature at all registers. For the ordinary residence job, the usual practice is to calculate adequate heat delivery at the register most distant from the heating plant and damper down for registers closer to the furnace.

It is axiomatic that warm air in traveling through ducts, loses both temperature and velocity. While these losses are customarily figured carefully in industrial and large public buildings, it has sometimes seemed unnecessary for the residential contractor to establish a simple and accurate method for calculating these losses in the ordinary residence system.

Exhaustive tests have now made it possible to readily calculate temperature and velocity losses for each register and build a resistance balanced duct system that will materially reduce dampering and greatly simplify the balancing of the system. With a balanced design of this type, the contractor



The floor plans above and the heat loss sheet following were selected as a typical installation for explanation of the author's suggested balancing procedure. Sizes and losses shown are used in the tables set up for the job.

Standard Code Requirements

NAME PROBLEM E.F. FULLER ENGR. CO.
ADDRESS NASHOTAH, WIS.

OWNER
CONTRACTOR



DATE 4-FEB. 1939
FIGURED BY E. F. FULLER

BUILDING AT _____

TYPE OF CONSTRUCTION (Table A) EXPOSED WALLS

FIRST FLOOR		Net	Factor	Results	Sq. In. Required	Exposure	2nd.	FLOOR		Net	Factor	Results	Sq. In. Required	Area of W.A. Pipe
1. KIT.	Length 9	Width 8	Height 8				5. Bd. Rm.	Length 10	Width 9	Height 8				
Sq. Ft. of Glass & Outside Doors. Note A	16	1.13	18				Sq. Ft. of Glass & Outside Doors. Note A	26	1.13	30				
Sq. Ft. of Net Less Glass Exposed Wall	110	.263	29				Sq. Ft. of Net Less Glass Exposed Wall	126	.263	33				49.9
Sq. Ft. of Ceiling (If No Heated Room Above) Note B	18	.432	8				Sq. Ft. of Ceiling (If No Heated Room Above) Note B	90	.26					
Cubic Contents Note C		+ 800	55				Cubic Contents Note C		+ 800					
Total							Total							
Multiply by—9 for First Floor					x 9		Multiply by—9 for First Floor							
Required area of basement W. A. Pipe for South Exposure							Required area of basement W. A. Pipe for South Exposure							
For West Exposure—Add % Note D	10		61				For Exposure—Add % Note D							
Int. CEIL 32 x 1/23 A. Pipe	4.0						26' CRACK 12.3 Required Area of Basement W. A. Pipe							3.2
For 90° Temperature Rise. Subtract % Note E	5.5						For 90° Temperature Rise. Subtract % Note E	6.3		5.7				8.9
Required Area of Basement W. A. Pipe	9.5						Required Area of Basement W. A. Pipe							10.1
2. DIN.	Length 12	Width 10	Height 8				6. Bd. Rm.	Length 12	Width 9	Height 8				
Sq. Ft. of Glass & Outside Doors. Note A	47	1.13	53				Sq. Ft. of Glass & Outside Doors. Note A	26	1.13	30				
Sq. Ft. of Net Less Glass Exposed Wall	129	.263	34				Sq. Ft. of Net Less Glass Exposed Wall	142	.263	37				
Sq. Ft. of Ceiling (If No Heated Room Above) Note B		+ 800					Sq. Ft. of Ceiling (If No Heated Room Above) Note B	108	.26					
Cubic Contents Note C		+ 800					Cubic Contents Note C		+ 800					
Total							Total							
Multiply by—9 for First Floor					x 9		Multiply by—9 for First Floor							
Required area of basement W. A. Pipe for South Exposure							Required area of basement W. A. Pipe for South Exposure							
For Exposure—Add % Note D							For North Exposure—Add 15 % Note D	15		77				
34' CRACK 12.3 Required Area of Basement W. A. Pipe	4.2						20' CRACK 12.3 Required Area of Basement W. A. Pipe			2.5				
For 90° Temperature Rise. Subtract % Note E	7.8						For 90° Temperature Rise. Subtract % Note E	7.7		7.0				9.5
Required Area of Basement W. A. Pipe	12.0						Required Area of Basement W. A. Pipe							10.8
3. LIV.	Length 18	Width 12	Height 8				7. Bd. Rm.	Length 12	Width 9	Height 8				
Sq. Ft. of Glass & Outside Doors. Note A	67	1.13	76				Sq. Ft. of Glass & Outside Doors. Note A	10	1.13	19				
Sq. Ft. of Net Less Glass Exposed Wall	275	.263	72				Sq. Ft. of Net Less Glass Exposed Wall	150	.263	39				
Sq. Ft. of Ceiling (If No Heated Room Above) Note B	18	.382	7				Sq. Ft. of Ceiling (If No Heated Room Above) Note B	108	.26					
Cubic Contents Note C		+ 800					Cubic Contents Note C		+ 800					
Total							Total							
Multiply by—9 for First Floor					x 9		Multiply by—9 for First Floor							
Required area of basement W. A. Pipe for South Exposure							Required area of basement W. A. Pipe for South Exposure							
For N.W. Exposure—Add 15 % Note D	15		17.0				For N.W. Exposure—Add 15 % Note D	15		67				
50' CRACK 12.3 Required Area of Basement W. A. Pipe	6.0						17' CRACK 12.3 Required Area of Basement W. A. Pipe			2.8				
For 90° Temperature Rise. Subtract % Note E	16.0						For 90° Temperature Rise. Subtract % Note E	6.7		6.0				8.8
Required Area of Basement W. A. Pipe	22.0						Required Area of Basement W. A. Pipe							10.1
4. Bath	Length 6	Width 6	Height 8				8.	Length	Width	Height				
Sq. Ft. of Glass & Outside Doors. Note A	12	1.13	14				Sq. Ft. of Glass & Outside Doors. Note A		+ 12					
Sq. Ft. of Net Less Glass Exposed Wall	100	.263	26				Sq. Ft. of Net Less Glass Exposed Wall		+ 8					
Sq. Ft. of Ceiling (If No Heated Room Above) Note B		+ 800					Sq. Ft. of Ceiling (If No Heated Room Above) Note B		+ 8					
Cubic Contents Note C		+ 800					Cubic Contents Note C		+ 800					
Total							Total							
Multiply by—9 for First Floor					x 9		Multiply by—9 for First Floor							
Required area of basement W. A. Pipe for South Exposure							Required area of basement W. A. Pipe for South Exposure							
For West Exposure—Add % Note D	10		44				For Exposure—Add % Note D							
17' CRACK 12.3 Required Area of Basement W. A. Pipe	2.2						Required Area of Basement W. A. Pipe							
For 95° Temperature Rise. Subtract % Note E	4.2						Add % Note E							
Required Area of Basement W. A. Pipe	6.4						Required Area of Basement W. A. Pipe							

CEILINGS		FLOORS	
2nd.	1st.	FLOOR	
5. Bd. Rm.	Length 10	Width 9	Height 8
Sq. Ft. of Glass & Outside Doors. Note A	26	1.13	30
Sq. Ft. of Net Less Glass Exposed Wall	126	.263	33
Sq. Ft. of Ceiling (If No Heated Room Above) Note B	90	.26	
Cubic Contents Note C		+ 800	
Total			
Multiply by—9 for First Floor			x 9
Required area of basement W. A. Pipe for South Exposure			
For Exposure—Add % Note D			
26' CRACK 12.3 Required Area of Basement W. A. Pipe			3.2
For 90° Temperature Rise. Subtract % Note E	6.3		
Required Area of Basement W. A. Pipe			
6. Bd. Rm.	Length 12	Width 9	Height 8
Sq. Ft. of Glass & Outside Doors. Note A	26	1.13	30
Sq. Ft. of Net Less Glass Exposed Wall	142	.263	37
Sq. Ft. of Ceiling (If No Heated Room Above) Note B	108	.26	
Cubic Contents Note C		+ 800	
Total			
Multiply by—9 for First Floor			x 9
Required area of basement W. A. Pipe for South Exposure			
For North Exposure—Add 15 % Note D	15		77
20' CRACK 12.3 Required Area of Basement W. A. Pipe			2.5
For 90° Temperature Rise. Subtract % Note E	7.7		
Required Area of Basement W. A. Pipe			
7. Bd. Rm.	Length 12	Width 9	Height 8
Sq. Ft. of Glass & Outside Doors. Note A	10	1.13	19
Sq. Ft. of Net Less Glass Exposed Wall	150	.263	39
Sq. Ft. of Ceiling (If No Heated Room Above) Note B	108	.26	
Cubic Contents Note C		+ 800	
Total			
Multiply by—9 for First Floor			x 9
Required area of basement W. A. Pipe for South Exposure			
For N.W. Exposure—Add 15 % Note D	15		67
17' CRACK 12.3 Required Area of Basement W. A. Pipe			2.8
For 90° Temperature Rise. Subtract % Note E	6.7		
Required Area of Basement W. A. Pipe			
8.	Length	Width	Height
Sq. Ft. of Glass & Outside Doors. Note A		+ 12	
Sq. Ft. of Net Less Glass Exposed Wall		+ 8	
Sq. Ft. of Ceiling (If No Heated Room Above) Note B		+ 8	
Cubic Contents Note C		+ 800	
Total			
Multiply by—9 for First Floor			x 9
Required area of basement W. A. Pipe for South Exposure			
For Exposure—Add % Note D			
Required Area of Basement W. A. Pipe			
For Temperature Rise. Subtract % Note E			
Required Area of Basement W. A. Pipe			
Carry Over	<u>34.4</u>	<u>34.4</u>	<u>81,000</u>
Total First Floor			

can start at any register and carry through with assurance that the system will work with little or no dampering. On this type of system, dampers in stack heads only, are recommended by the author.

Before commencing to balance, one of the following sets of instruments is recommended:

1—Anemometer, stop watch, and thermometer.

This combination requires triple concentration, but can be readily used by one person.

2—Velometer, or grilometer, and thermometer. These instruments give direct velocity readings, which greatly simplify calculations. The thermometer may be suspended over the grill, and velocity and temperature readings taken simultaneously, by

DATA SHEET No. 752
E. F. Fuller Engineering Co., Nashotah, Wis., Feb. 4, 1939

Room	Distance Reg. to MKL.*	Furnace	CFM	Actual Reg. Temp.	CFM Factor from Table 1	Velocity Reading	Size of Riser	Size of Register
Kitchen	9.5	10	100	150	95	300	3½x10	5x10
Din. Room	12.0	10	131	150	95	314	3½x12	5x12
Liv. Room 1	12.0	20	134	147	90	322	3½x12	5x12
Liv. Room 2	10.0	40	130	141	78	312	3½x12	5x12
Bath	6.4	30	80	144	84	232	3½x10	5x10
Bd. Room 1	10.1	10	110	150	95	319	3½x10	5x10
Bd. Room 2	10.8	40	140	141	78	280	3½x14	5x14
Bd. Room 3	10.1	20	113	147	90	271	3½x12	5x12
	81.0		938					

*1 MKL. = 1,000 Btu's.

one person.

3—The heated thermometer anemometer, is particularly useful for measuring air movement in front of exhaust hoods, or grills, that cannot be measured conveniently or accurately by other methods.

The problem to demonstrate balancing procedure has been selected from a type of system that is frequently found in replacement jobs.

1—Building construction: frame siding, building paper, 1 inch sheathing, studding, lath and plaster. (No insulation.) (No storm sash.) Most new residences are built with insulation of some kind, storm sash, weather strips, and other heat saving construction. These measures greatly reduce the maximum heat loss, annual fuel consumption, as well as the installation cost of furnace and ducts.

2—Temperature difference 90 deg. F.

3—Heat Loss Calculation and Data Sheet.

4—Floor Plans of Building.

Explanation: (In six steps) [See Data Sheet]

1—Using manufacturers data, adjust motor pulley to attain correct number of revolutions per minute of blower, to deliver total cubic feet per minute to heat the building. (938 cfm.)

Equipment: Stop watch and revolution counter.

2—To determine distance from furnace to register, measure horizontal distance in units of ten feet and add ten feet for each fitting, for total distance. (Equivalent length.)

3—Register temperature depends on distance of register from furnace. Basis of calculation: 150 Deg. F. register temperature at 10 feet.

4—C. F. M. FACTOR TABLE No. 1

Distance (Reg. to Furn.)	10	20	30	40	50	60
Reg. Temp.	150	147	144	141	138	135
C.F.M. Factor	95	90	84	78	72	60

NOTE: CFM factor compensates for both temperature and velocity losses.

MKL

CFM EQUATION: $\frac{10,000}{CFM \text{ Factor}} = CFM$

If MKL is 10 and CFM factor is 78, equation equals:

$$\frac{10,000}{78} = 130 \text{ CFM. (approx.)}$$

The CFM Factors (Table No. 1) for temperature and velocity losses by air travel through sheet metal ducts have been established by an exhaustive series of tests in existing forced air circulating systems.

5—REGISTER AND RISER TABLE No. 2

MKL.	Riser	Register	Register Temp.
8.0	3½x10	5x10	120 or over
10.0	3½x10	5x10	150-147
10.0	3½x12	5x12	144-120
12.0	3½x12	5x12	150-147
12.0	3½x14	5x14	144-120
14.0	3½x14	5x14	150-147

Note 1: Select risers and registers based on register temperature from table No. 2.

Note 2: Over 14.0 MKL. use two or more registers for residence work.

6—REG. VELOCITY FACTOR TABLE No. 3

Register	Factor	Multiply CFM by Register Factor to get velocity. If CFM is 130 and register is 5x12, multiply $130 \times 2.4 = 312$ ft. per minute velocity.
5x10	2.9	
5x12	2.4	
5x14	2.0	

Note: The above calculation is based on ducts without covering or insulation.

The Register Factor (Table No. 3), represents the distance air will have to travel through registers to pass one cubic foot of air per minute. If we wish to pass 1 cu. ft. of air per minute through a 5x12 register, the velocity would have to be 2.4 ft. per minute. If we wish to pass 130 cu. ft. of air per minute, the velocity will have to be $130 \times 2.4 = 312$ ft. per minute.

I have been using the University of Wisconsin Course, methods of Heat Loss Calculations in my business ever since 1931.

The strong points, in my opinion, are:

1—This course advocates the Btu method of heat loss calculation, using ASH&VE GUIDE Tables giving "Coefficients of Heat Transmission" of ma-



The blower is set for required air delivery by adjusting the motor pulley or, in some cases, by changing the motor pulley size. A revolution counter is required.

terials entering into the construction of buildings, instead of calculating heat loss by the very uncertain method based on the cubical contents of buildings.

2—In 1931, Professor Dean recommended the calculation of infiltration through cracks about windows and doors, instead of estimated air changes.

3—An allowed register temperature of 150° F. was also approved as a basic design factor for the calculation of the size of sheet metal ducts.

All of the above strong points are incorporated in the "New Technical Code" and are generally ac-



An anemometer and a stop watch being used to establish cfm delivery from velocity. Spot readings across the register face are preferred to one spot reading.

cepted by leaders in the industry.

My particular aim in this article is:

1—To help establish greater uniformity in the calculation of heat loss of buildings.

2—Offer a simple, accurate method for the calculation of temperature and velocity losses by forced air traveling through sheet metal ducts. TABLE 1.

3—Establish a simple method of selecting the right risers and registers. TABLE 2.

4—Establish a simple method to calculate the velocity required to deliver the necessary cubic feet of air per minute through the ordinary sizes of registers used in forced air systems. TABLE No. 3.

5—Simplify routine methods for balancing the system.

Method For Calculating Heat Loss

(Continued from page 52)

Set these in lines 11 and 21.

D. H. wood sash, with storm sash, in 15 mile wind = 37.5 cfm (Table 2).

D. H. wood sash plain, in 15 mile wind = 39.3 cfm (Table 2).

A table I have worked out (Construction Information) shows coefficient in first case to be .68 ($37.5 \times .018$) and for 2nd case .71 ($39.3 \times .018$). Set these in line 12.

Floor = 120 sq. ft. coefficient from GUIDE = .14. Set these in line 22.

Lines 6, 7, 8, 16, 17, 18 would be filled in the same manner.

In the working table I use, heat losses for temperature differences and various constructions can be read directly. Thus for a coefficient of .45 and

a temperature difference of 85 deg. we read directly the Btu for 24 sq. ft. which is 918 exact.

In same way read Btu for all others. A typical abbreviated table is published on the first page of this article.

No Mathematics Needed

It thus seems to me that the only place where any head work is needed, to fill out a calculation sheet, is to pick the correct coefficients and place them in the right space. This is only confusing where walls of a room are of different construction, or some windows are storm sash or plain in the same room. This calls for a different coefficient. The rest is easy as my Table provides for an outside T. D. range from 32 deg. to -20 deg. up to and including temperature of 75 deg. (or 70 deg. inside - 25 deg. outside).

The "Construction Information" sheet would be made up from the architect's drawing. Writing out

(Continued on page 108)

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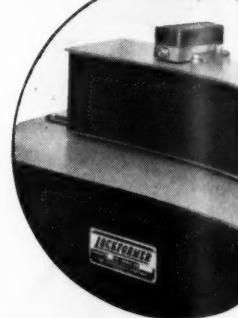
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Stainless Steel Dome at Baylor University

BAYLOR UNIVERSITY and citizens of Waco, Texas, are rightly proud of the new Administration Building of the university completed late last year. The building is part of a comprehensive program under consideration which includes a girl's dormitory and a Students Union building.

The Administration Building was designed by Birch D. Easterwood and Son, Waco architects, who have a number of imposing buildings to their credit. The general contractor was S. B. Swigert who has done a great deal of work for the University.

Of Colonial architecture, the dominating feature of the new building is the imposing tower with its shining stainless steel dome, cupola and finial. All sheet metal work was fabricated and installed by C. H. Ruebeck Company, Waco. Included in the sheet metal contract was the natural slate roofs on pitched slopes and the flat decks and roofs of all off-sets which are covered with copper. Also in the Ruebeck contract, was the application of Cheney flashing for weather protection of exposed sections. The first floor of the building is air conditioned and there is an extensive mechanical ventilating system for

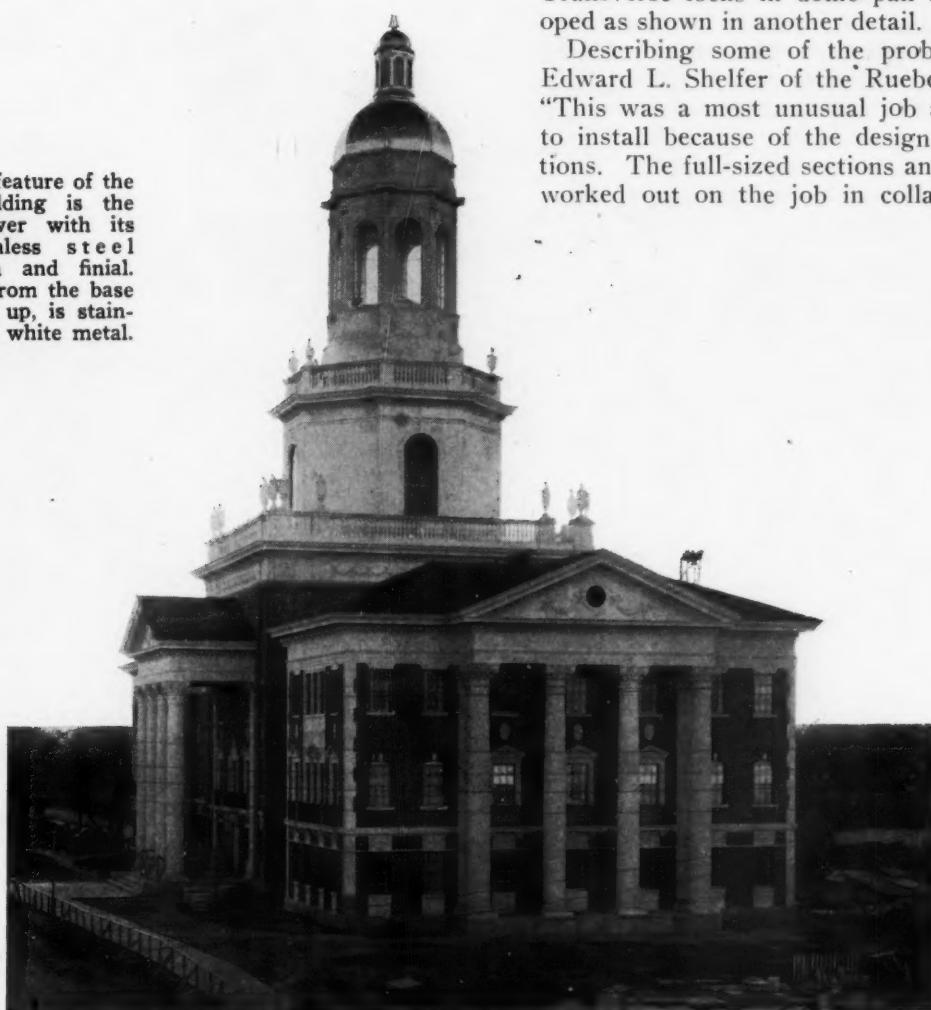
the top floor of the main part of the building (directly below all roofs). Both these systems were installed by the Ruebeck Company.

The stainless steel covered dome and cupola are 150 feet above the ground. In the belfry of the tower (open section immediately below the dome) there is a set of chimes donated to the university by the late Cullen F. Thomas. The full tower is divided into sections. At the base there is a flat offset and deck surrounded by a balustrade. Copper flashing, copper gutters and a copper deck protect this area. The eight sided base, in turn, is topped by another flat deck (copper covered) behind a balustrade and above this is the chime belfry. Up to the top of the belfry, all exteriors are stone.

The dome above the belfry, as shown in the photographs and details, is covered with stainless steel (24-gauge Enduro 18-8, No. 4 finish) divided into segments by battens of inverted trapezoidal section (see detail). The pan sheets were turned up approximately $\frac{1}{2}$ inch short of the batten so that there is approximately $\frac{1}{2}$ inch of space between sheet and batten for expansion. The batten cap was loose double locked to the pan sheets so that movement may occur here through slippage in the cleats. Transverse locks in dome pan sheets were developed as shown in another detail.

Describing some of the problems encountered, Edward L. Sheller of the Ruebeck Company said, "This was a most unusual job and a difficult one to install because of the design of the metal sections. The full-sized sections and dimensions were worked out on the job in collaboration with the

The striking feature of the beautiful building is the imposing tower with its shining stainless steel dome, cupola and finial. All exterior from the base of the dome, up, is stainless steel and white metal.



general contractor, architect and officials. The cupola, or that section above the main dome, was fabricated and assembled in the shop as the photographs show. This was necessary because all the miters are reinforced and welded from the back side into complete sections, then the complete unit was hoisted and dropped over the framing prepared to receive it. This procedure eliminated all welding on the outside which might have been unsightly if carelessly done.

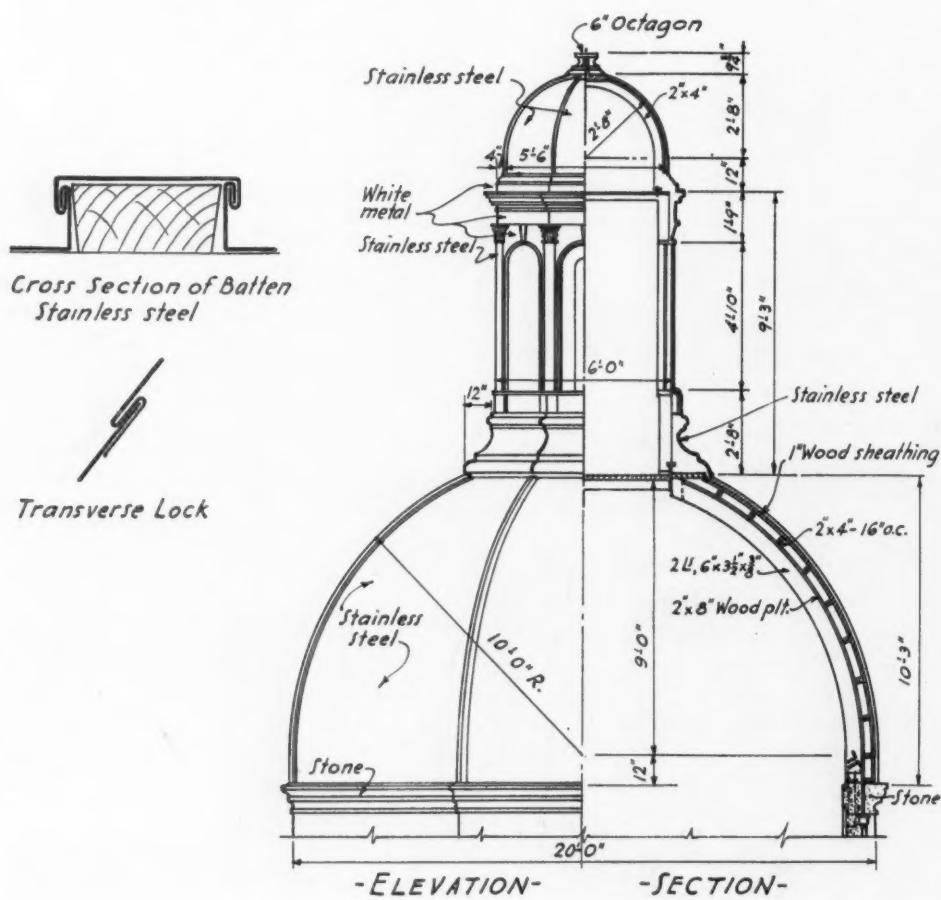
"The circular head sash which appear on the eight sides of the cupola were formed of zinc bars with amber cathedral glass and used to enhance the lighting effects. The lantern shaped section at the top of the tower was added near completion to enclose a steam pipe from which steam exhausts when the flood lighting is turned on. The effect is clouds emanating from the tower.

Fabrication of the Dome

"The metal clad dome was fabricated of flat sheets running transversely around the dome. In order to provide for expansion and contraction, the type of batten and the pan sheet formation shown in the detail were devised. Where the sides of the pan sheets meet the battens the metal was turned up as shown, which is familiar construction, but because of the curvature of the dome, the sides had to be stretched into shape—a rather difficult job because no stretching marks could show. These dome sections were installed without the use of any special fastening or welding, being held in place at intervals with concealed cleats so that the completed dome presents a smooth, perfect surface.



Above—Closeup of the belfry (open section) dome cupola and finial. Compare with details below and shop photographs following to visualize construction. The method of assembling and installing sections was particularly interesting.



Left—Details showing pieces and sections and application of stainless steel to the dome, cupola and finial. Expansion was provided for by space along both sides of each batten. The transverse seam used is shown. The dome curve was stretched for by hand forming the pan sheets, described in the text.



One mechanic is holding a cupola column with the cast aluminum capital. At his feet are two base sections for the top dome. The other mechanic stands behind two joined sections of the cupola (see photograph below). Base sections were formed from a single sheet; miters were joined behind by welding.

"The closeup of the cupola and the work bench pictures establish the sizes of the sections, particularly the cupola base which is composed of several curved and flat faces welded into a complete base along the miters. The cupola columns are stainless steel with cast aluminum capitals. The panel facings were all formed and assembled from stainless steel. The cornice between the cupola and the dome was formed in complete sections as shown in the

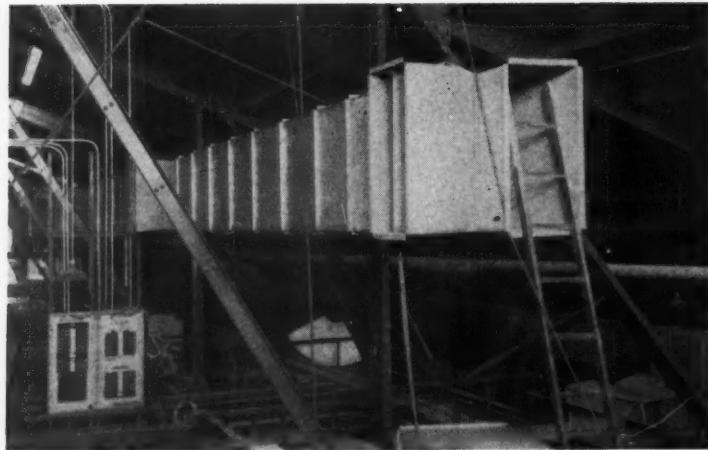
two shop photographs. Intricate forming was required in both base and cornice.

"Because of the intricate metal sections required and the close fitting of parts necessitated, the cooperation of the other crafts in adjusting framing details to our needs was a great help. Since the installation was in our home city we were able to lay out all sections from job measurements and give all progress close supervision."



Above—End view of a cupola base section showing formation of curved and flat surfaces and an end view of a cornice section. Right—Closeup of the sheet metal sections showing final application of the sections shown in shop pictures.





55 Tons of 14-Gauge Ducts

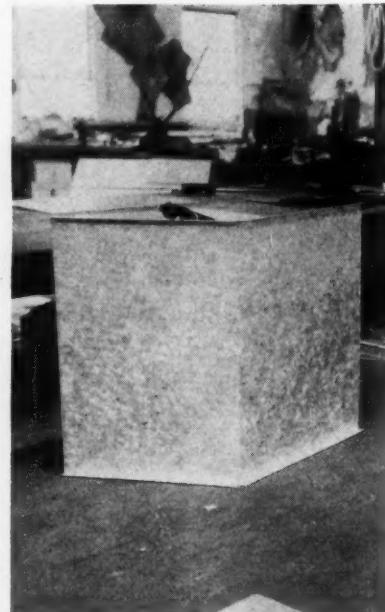
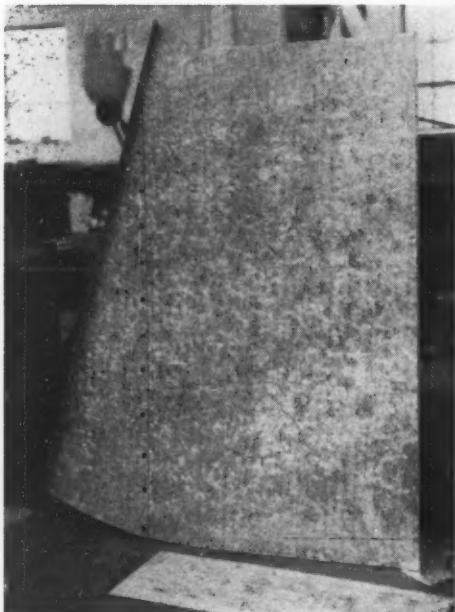
THE new auditorium at Michigan State College, East Lansing, Michigan, is an unusual building; one of the interesting features being the heating and ventilating system installed by Michigan Sheet Metal Works, Lansing. There are two auditoriums; one large, the other small, with a huge stage between the two auditoriums opening both ways. A balcony projects over the main floor on three sides with the space beneath the balcony used as corridors, class rooms and exhaust air plenums. There are no columns in the rooms and the ceiling is the bottom chords of the roof trusses.

The heating and ventilating system introduces air through interesting diffusers at the ceiling and exhausts through returns in balcony risers and through exhausts in the lower side walls. Supply fans, heater coils and supply ducting; exhaust fans,

outside air intakes and exhaust ducting are all in the roof trusses as the plan shows.

The system handles enormous quantities of air through very large and heavy gauge ducts. The problem which confronted Michigan Sheet Metal Works was to fabricate the large and heavy duct sections in such sizes and weights that erection could be handled with a relatively small crew. Because of the size and location of the duct sections, the contractor had to submit to the architects a single line drawing (reproduced) showing exactly where the ducts could run and sufficient details to show just how the duct sections could be placed between members of the roof trusses. Ducts were, accordingly, located from measurements made in the trusses. About two months were required to prepare the necessary architect's and shop draw-

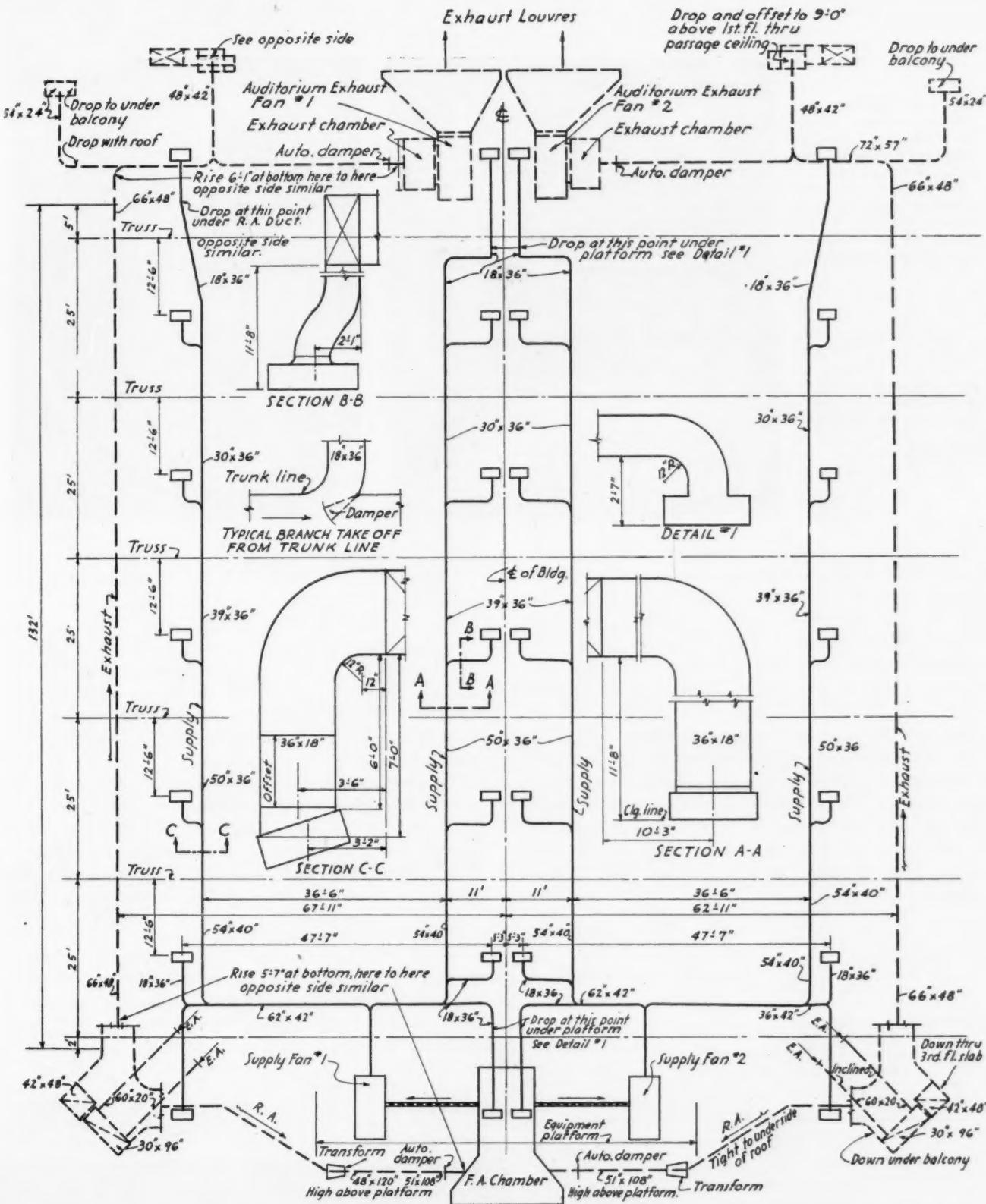
Above—Run of supply duct in trusses. An exhaust line is just visible in the background. Below, left—Bottom of elbow showing triangular scrap spot welded to rectangle to use up scrap. Center—Spot welding section shown at the left. Right—Side of elbow showing bend and formed edges. Edges were turned after bolting holes were punched.



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Composite plan of supply and exhaust lines in roof trusses. Branches to special diffusers are shown. Cross sections and details furnish explanation of construction. The duct sizes shown indicate the problem of raising and erecting the heavy sections.

ings. Changes had to be made from the original architect's drawings to compensate for actual building conditions.

Practically all the duct work and housings in the attic are built of 14-gauge galvanized iron. Risers and duct work under the balconies are lighter stock according to ASHVE gauges and widths tables. For the whole contract some 55 tons of 14-gauge and 65 tons of lighter material were required.

In general, except for complications of available

space, the light gauge sections were not a particular problem. Risers, fittings, under balcony ducts, etc., were fabricated in customary lengths, with two or four pieces to a section depending on size, with Pittsburgh seams and standing "S" locks. As the system was installed far ahead of the interior finishers, the sheet metal contractor had little difficulty with this part of the contract.

The 14-gauge ducts in the trusses, however, offered real problems of fabrication and erection.

Right—A special set up of noses on a small power brake were used to form bolting edges after bolt holes were punched. The welders are using a special clamping jig to weld a housing section which was delivered completely assembled.

Below—Details of the three types of supply diffusers. These are patented and purchased units supplied to specifications for diffusion. Note that diffusion is adjustable through the set of the blades.

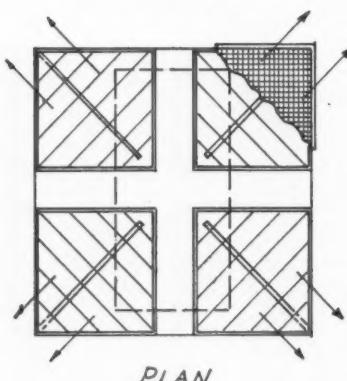
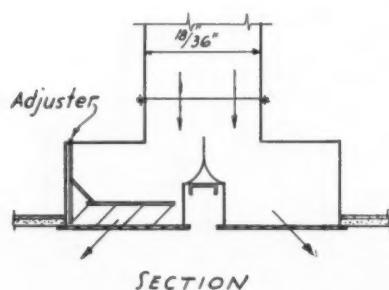


Study decided that these heavy sections should be made in lengths of 3 feet in order to get the pieces into the trusses and to reduce the weight to be handled by the erectors. Depending on the dimensions of the ducts, the sections were made as either four pieces or as two pieces. Also, some dimensions could be cut best from stock as two or four pieces, so this was also a consideration.

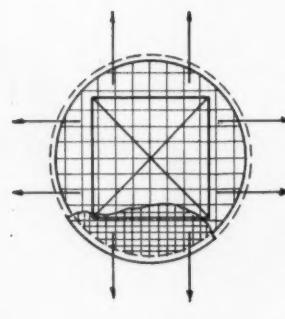
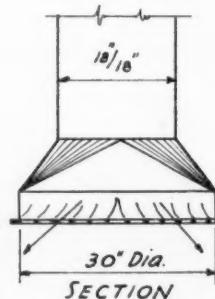
The two or four longitudinal seams in each section were arc welded in the shop so that each three-foot section was delivered ready to raise into position. The exceptions were the very large duct sections near the fans which, because of size and weight, were delivered as pieces which were bolted together.

Cross seams were formed by turning edges all around the duct and punching these flanges for bolts. On the job these flanges were bolted to the previously erected section as shown in some of the job pictures. Drive cleats, stiffening angles, and gaskets were not used since the flanges in 14-gauge are self stiffening and bolts were placed at frequent intervals. To obtain air tightness the bolted seams were caulked.

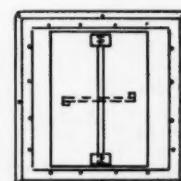
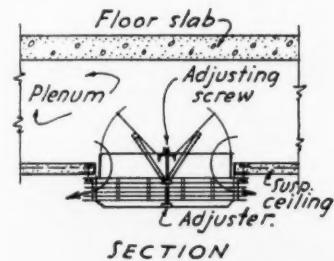
To erect the attic ducts the mechanics laid plank scaffolding across the truss bottom chords, raised each section to the planking, then by block and tackle raised the section into position for bolting (see construction photographs). Housings for coils and filters were built by erecting the equipment and



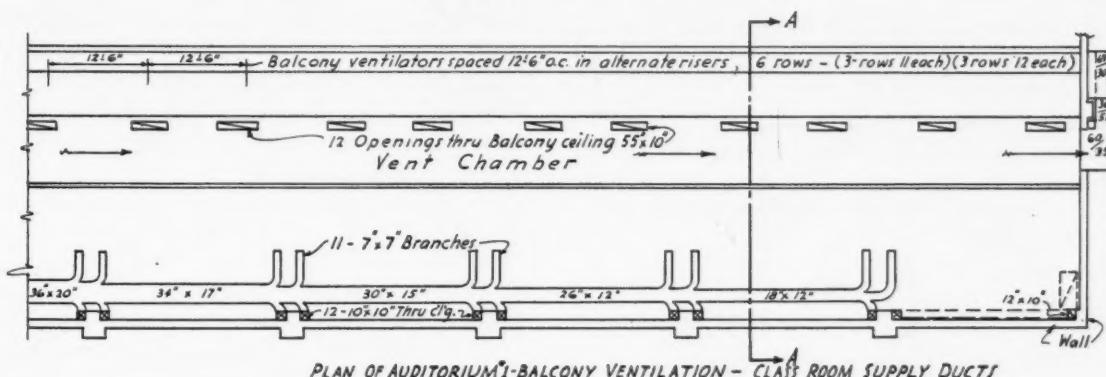
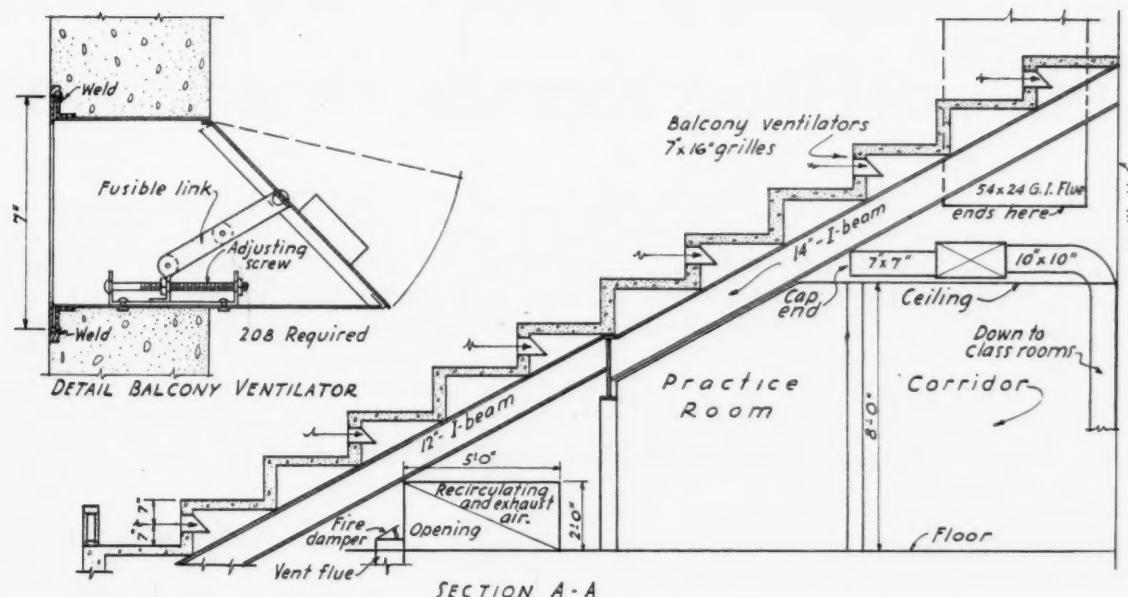
TYPICAL DIFFUSER DETAILS
AUDITORIUM #1, CEILING



TYPICAL DIFFUSER DETAILS
AUDITORIUM #2, CEILING



TYPICAL DIFFUSER DETAILS
EXHIBIT ROOM



Cross section of the exhaust through balcony risers into plenums which are exhausted through the roof system. The detail shows the adjustable damper used to balance exhaust over the balcony.

building a 14-gauge housing around the units. Angle iron was used for the frames.

In the shop the material was first cut on power shears to size according to the particular section. Holes were punched for bolting and then the two end edges were flanged and mitered if two sides were cut from one sheet. The final shop operation was arc welding the longitudinal seams. One of the pictures shows a top piece of a turn made of two pieces spot welded together (see spot welding picture also). This used up scrap and eliminated considerable cutting of heavy sheet to make the

triangle piece.

One of the details shows the unusual ceiling diffusers of three types. These were bought by Michigan Sheet Metal Works as complete units ready to connect to the branches shown on the attic plan. Eleven circular, 28 large square, and 42 small square diffusers were required.

The attic duct work is not insulated, but all risers to and from class rooms are lined on the inside with Dux-Sulation by another contractor. The lining was applied on the job so ducts were delivered as open sections. Ventilation risers, especially those in outside walls, are insulated on the outside against heat loss; this application was also done on the job by the insulating contractor.

One of the interesting features is the exhaust into spaces beneath the balcony. As shown, the inlets are placed in the seat risers and open in two plenums (one at the bottom, one at the top) from which ducts lead to the risers to the exhaust fans in the attic. The welded angle iron frames were placed before concrete was poured and sealed. Later the faces with the adjusting valve pictured were installed. Two hundred and eight inlets were required. Balancing of the intake through each inlet was done by adjusting the valve shown so that exhaust is uniform all over the balcony. The valves also have fusible links to shut off exhaust in case of fire in any part of the balcony.



Looking into the exhaust duct line at the turn above the stage. Note size of ducts from comparative hand rail height.

Essentials of Good Exhaust System Design

This article is an address delivered by the author before the Sheet Metal Contractors Ass'n of Wisconsin, 1940. The basic principles of good design and construction for exhaust systems are outlined and explained with particular attention to features often misunderstood or neglected.

By O. T. Nelson

Building Engineer, Industrial Commission of Wisconsin, Madison

THE purpose of this paper is to set forth the essentials of good practice in the design of exhaust systems without entering too deeply into the extremely theoretical problems, except where such detail is necessary for purposes of illustration of the points involved.

The construction and satisfactory operation of an exhaust system is dependent mainly on three items:

- (1) Proper design and construction of the duct system itself.
- (2) Selection of the proper type of collector to suit the entrained materials.
- (3) Selection of a blower of proper type with sufficient capacity to operate against the resistance of the system.

In the design of the duct system the first step is to determine the specific gravity of the materials to be carried. The required static pressure to be obtained in each branch duct is dependent on this. This static pressure, or suction, is obtained by application of the empirical formula provided in the General Orders on Dusts, Fumes, Vapors and Gases as follows:

$$\text{Required Pressure} = 2 + \frac{\text{specific gravity of entrained materials}}{4}$$

Where more than one material is to be carried in the same duct the specific gravity of the heaviest material will need to be used. In no case, however, shall this pressure be less than 2 inches of water.

Determination of Branch Pipe Size

Logically, the next step is the determination of the necessary branch duct sizes, inasmuch as the total volume of air, as well as the sizes of the main duct depend upon the areas of the individual branches. For grinding and buffing wheels, the branch duct diameters are based on the diameter and thickness of the wheels to be used. While our code does not go into detail as to these dimensions, the New York State Code has provided them in tabulated form, as well as those for various wood-working machines. These recommended sizes are quite generally available in various catalogues and text books and their use is recommended. Tumblers have the necessary pipe size generally predetermined by the trunnion opening and the branches which are provided should be sized for each individual case. For other equipment, the branch duct sizes will need to be determined by the correlation of the required velocity over the face of the hood, the hood area and the pressure which is required to be provided in the branch.

The volume of air necessary for each branch duct is determined by multiplying the area of the duct in question in square feet by the air velocity through the duct. This velocity is a function of the required pressure and is expressed by the formula,

$$V = 4005 \sqrt{\text{suction}} \times .71$$

The latter figure is the orifice coefficient or coefficient of restriction, and, while it may vary somewhat for different openings, the one expressed above is most commonly used. The total of all

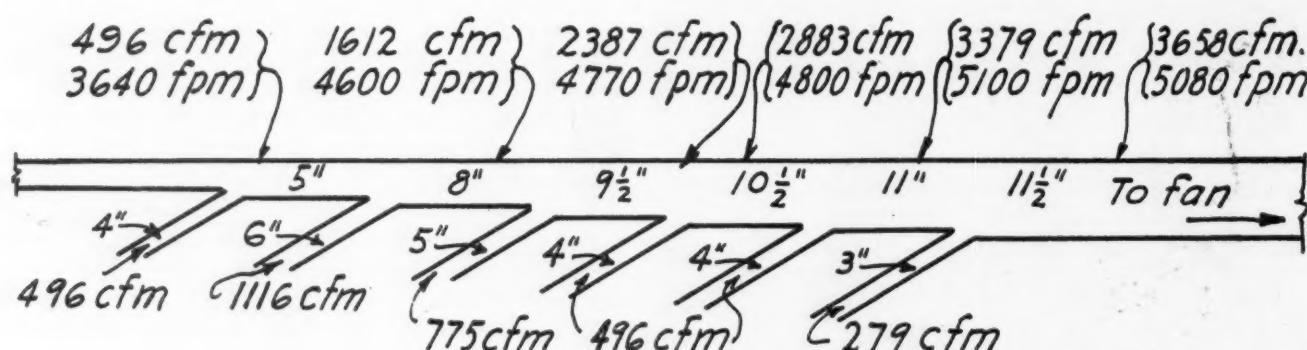


Fig. 1

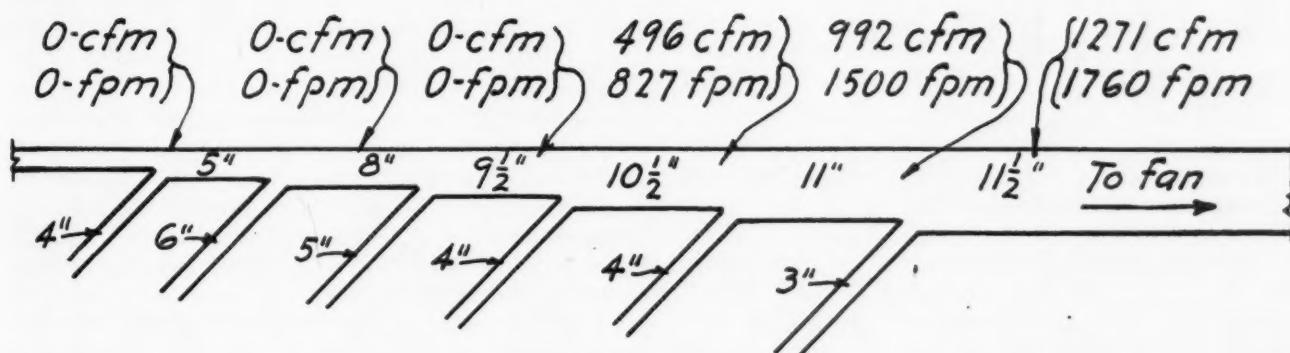


Fig. 2

branch volumes will give the volume of air for the entire system and will be satisfactory if a tight system of duct work can be assured. Frequently, however, an addition of from 5 to 10 per cent is made to provide for possible leakage.

Main Duct Sizing

In figuring the sizes of the main ducts, our code specifies that the progressive areas shall be not less than 110 per cent of the sum of the areas of the entering branches served by each section of main. The general tendency among designers has been to go beyond this requirement, and in some cases their zeal in trying to reduce friction losses by increasing the cross sectional area of the main ducts has resulted in velocities so low that the entrained materials can not be carried in suspension. Care should also be taken to assure generally uniform velocities through the main ducts and even preferably providing increasing velocity toward the fan. In no case, for entrained dust, should these velocities fall below 3500 feet per minute. This can readily be checked by totaling the amount of air passing through any particular section of duct and dividing by the area of that point, in square feet.

Blast Gates Are Questionable

The value of blast gates in branch ducts is debatable, and, while there is no prohibition in our code to their installation if they do not restrict the duct area and are properly used, the tendency is to be too promiscuous in closing the gates and thereby reducing the air volume and velocity in the main duct to a dangerous point. This can perhaps best be illustrated by a rough sketch of a main duct and its entering branches (Fig. 1).

This illustrates values for a suction of 4 inches of water in each branch, together with the volumes and velocities in the main ducts which are sized to the nearest half inch above the computed required area. If the first three branches were shut off, the volumes and velocities in the main duct would then be as in Fig. 2.

From this it can be seen that the transporting velocities become entirely too low, and as a result materials will not be properly suspended in the

air stream tending to clog the main duct and leave the system inoperative.

With the duct system designed, it becomes necessary to select a fan of proper type and size and sufficiently powered to operate against the total resistance of the system. Essentially there are three resistances or losses which must be considered:

- (1) The initial or entrance loss.
- (2) The friction loss through the duct system.
- (3) The collector loss.

The pressure loss at the entrance into an exhaust hood may be written as follows:

$$h' = h - h_v \quad (\text{From Drinker \& Hatch})$$

where, h' = the pressure loss in inches of water
 h = static suction in the branch pipe
 h_v = velocity head in the branch pipe in inches of water

The static suction is known from code requirements, and the velocity head or pressure may be obtained from the formula:

$$VP = \left(\frac{V}{4005} \right)^2$$

V , in this case, is the velocity in the branch derived from the suction requirements.

Velocity Pressure

To illustrate what this velocity pressure may be under varying conditions, let us first assume that iron is the entrained material requiring a suction of 4 inches with the customary factor of .71. On this basis the necessary substitution in the above formula would give,

$$VP = \left(\frac{5680}{4005} \right)^2 = 1.42^2 = 2.02 \text{ inches}$$

In this case the hood loss therefore would be,

$$h' = 4" - 2" = 2"$$

Similarly, silica dust with its required 2.7 inch suction would give,

$$VP = \left(\frac{4663}{4005} \right)^2 = 1.16^2 = 1.35"$$

and,

$$h' = 2.7" - 1.35" = 1.35"$$

Also for the minimum suction of 2 inches,

$$VP = \left(\frac{4020}{4005} \right)^2 = 1''$$

and,

$$h' = 2'' - 1'' = 1''$$

This shows that the hood or entrance loss may safely be figured at one-half of the required static pressure or suction in practically all cases.

The friction loss, or resistance to air flow within the duct system involves a number of items including the air velocity, pipe diameter, length of pipe, number of elbows, convergence and divergence of pipes, etc.

The velocity in the branch ducts has been previously explained. For the mains, the velocity is determined by the summation of branch volumes and the area in square feet of the particular duct section in question. As has been brought out before, the code specifies the minimum size, but this should not be carried to excess as the velocity will then drop to such an extent as to lose its power to transport the material.

Factors Which Make Resistance

The degree of smoothness of the pipe will have a bearing on friction loss, increasing friction loss as much as 50 per cent for old, bent or otherwise damaged pipe as compared with a perfectly smooth interior. This loss can be figured by means of a more or less complicated formula which involves figures raised to fractional powers and will not be discussed. There are, however, charts and tables available in catalogues and text books that will give the friction losses for pipes of varying diameters and at various velocities, expressed in units of 100-foot lengths of pipe. Where shorter lengths than this obtain, and this is invariably the case, the friction loss for the length in question will be proportional.

This friction loss may also be roughly figured at one velocity head for each 40 diameters of pipe, and must be considered and figured for the entire length of duct from the end of the extreme branch to the termination of the discharge pipe from the fan.

Friction of Elbows

Elbows should be avoided as much as possible as they add to the friction loss over a corresponding amount of straight pipe. Ordinarily, an elbow friction is figured to be equivalent to 10 diameters in length of pipe of equal size. Each elbow **should also be followed** by at least 3 to 4 diameters of straight pipe.

In addition to elbows and straight pipe some resistance is also set up where one pipe joins and enters another. This connection sets up a turbulence which is appreciable and should be considered. In no installation should the angle of entry be greater than 45° and preferably 30° or less, inasmuch as the smaller the angle, the less the resistance. The branch pipe should also enter at the **side** of a transition piece in an ideal layout, with not more than one branch connecting to the same

transition piece. The area of this transition piece at the large end should be equal to the area of the small end plus 110 per cent of the area of the entering branch. Under no circumstances and at no time should branch ducts enter a main duct opposite each other due to the excessive turbulence which will be created. (Fig. 3.)

Sometimes it becomes necessary to use converging or diverging sections of pipe at the point of entry to the fan. Where a converging pipe is used, that is, where the area is decreased at the fan end, an added resistance is set up and should be taken into consideration. Where the pipe diverges or increases in area, a credit is obtained which will lessen the total resistance.

Traps and Collectors

Traps or classifiers are sometimes provided in the main duct line to trap out larger particles or foreign material, and when used must also be considered a source of increased resistance. Under no condition should screens be provided in systems because they will only serve to trap lint and other material and eventually obstruct the flow of air entirely.

The collector to be used must be carefully selected and should be of a type suitable for the material being handled. The manufacturer of the equipment chosen should be consulted in each case as to the exact resistance set up by the particular type of collector to be used. The various types of collectors may be placed in the following classifications: (1) Cyclone type, (2) Cloth arrester type, (3) Wet type, (4) Electrical precipitation type and (5) Dynamic precipitation type.

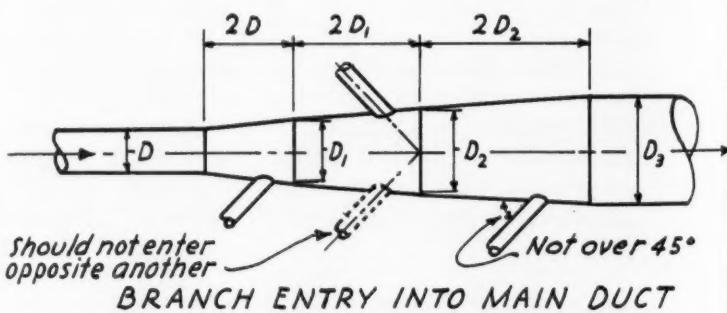
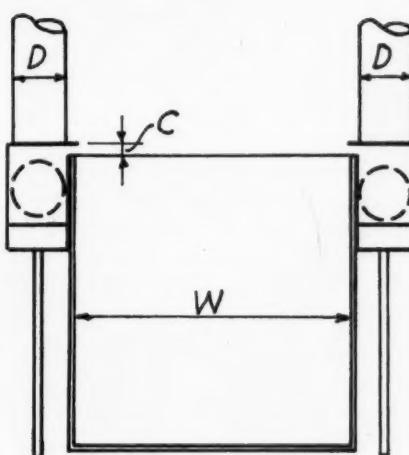


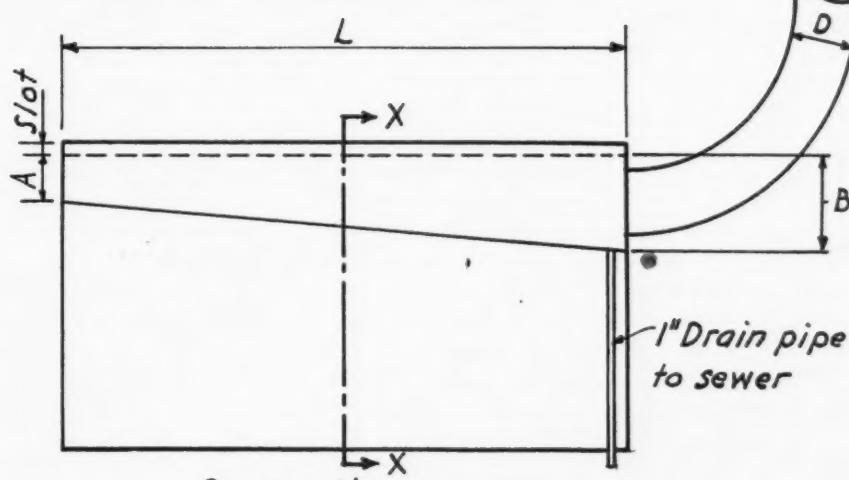
Fig. 3—Proper joining of branch pipes to the main showing angle of entrance and increase in main size. Note recommendation that branches be staggered.

The cyclone, particularly of the simple type, is not satisfactory or efficient for use with all materials. It can be used for shavings, sawdust, stringy material and similar items but is entirely too inefficient where fine dusts are concerned. The resistance for the simple cyclone is quite low, varying from $1\frac{1}{2}$ to 3 velocity pressures. For what is termed the high efficiency type and the multiple type this resistance will usually be not less than 4 velocity pressures.

Cloth arresters may be either the tube, envelope, screen or flat bag type. All are well adopted to any dry dust, but should not be used for temperatures in excess of 180° when equipped with the ordinary cotton fabric. For higher temperatures, special fab-



SECTION X-X



SIDE VIEW

$$A = L/12$$

$$B = 2A$$

$$C = \frac{1}{4} \text{ per foot of } W$$

$$D(\text{Area}) = C \times L/144$$

$$W = \text{Width of tank in feet}$$

$$L = \text{Length of tank in inches}$$

Air velocity at slot "C" = 2000 to 3000 fpm

PLATING TANK EXHAUST

Fig. 4—Design of slotted hoods for open top tank and notations covering width of slot, end size of hood, exhaust pipe diameter and construction.

rics containing asbestos, glass, wool, etc., should be used. Cloth arresters should not be used where there is moisture or vapor present in the exhausted air as this will cause caking on the fabric which cannot be removed by rapping. Provisions should be made for this rapping or shaking the accumulated dust from the cloth at regular intervals to keep the resistance from building up. The shaking or rapping must always be done when the exhaust system is shut down unless the arrester is designed as a continuous operating unit so that the air stream may be diverted from one unit to another while the dirty one is being shaken. In no case should the ratio of air volume to the area of the cloth exceed 3 to 1, with a lesser ratio even more preferable. Where there is a danger of fire from spark ignition within the arrester, the cloth should be impregnated with a fire-retardent material. When designing an exhaust system using cloth arresters, the maximum resistance developed by the dust mat between regular shaking periods should be used in the calculations, so that the required air velocities will be maintained at all times.

Wet Type Collectors

Wet type collectors may be of several types but in general depend upon three principles: (1) Impingement of the dirty air stream upon wetted surfaces, (2) Passing the air stream through a liquid bath or spray, and (3) Combination of both (1) and (2). The wet type collector is satisfactory for general use with high efficiency, and the resistance generally remains very constant providing the moisture eliminators are not permitted to become dirty or plugged up. This equipment will not freeze up in cold weather even if located out of doors, provided that the exhausted air passing through the collector is at room temperature or higher. De-

pending on the particular make or type of wet collector which is used, the resistance may vary from 2 to about 9 velocity pressures.

Electric precipitators will properly take care of practically any situation including dust, fumes, fog, mist or viscous matter. This operation consists of ionization of the entrained material and its collection on electrodes from which the solids may be removed by automatic washing, rapping, blowing or scraping devices. The efficiency is high and it will not be effected by moisture or heat and the resistance through the collector is relatively low. Up to the present time, however, the costs of installation and operation have prevented the use of this type of equipment to a great extent.

Dynamic Precipitators

Dynamic precipitators are composed of a combination fan and dust collecting unit designed and arranged so that the dust particles in the air stream entering the impeller are rotated at a high velocity and then ejected into a by-pass leading to a dust hopper or sludge hopper, depending on whether a dry or wet type is used. The dry type of this equipment has been thus far found very satisfactory for use in connection with grinder and tumbler exhaust, but where finer and lighter material, such as from sand blast booths and buffering wheels, prevails, the wet type should be used. If used in this manner they are very efficient. Due to the fact that this is a combined fan and collector, the resistance through the unit is provided for in the performance tables furnished in connection therewith.

All collectors which are used for combustible or explosive material must be located outside of any occupied area. In all cases, whether the material is combustible or explosive or not, the air must be discharged to the outside atmosphere in a proper

manner. Recirculation of this discharged air is not permissible, due to the fact that none of the existing collection devices are as yet sufficiently efficient to permit such recirculation.

Selection of Fans

Selection of the fans to be used must be made on the basis of operation against the various resistances outlined herein. Most fans are essentially of the centrifugal type provided by the various fan manufacturers and may be placed either ahead of, or beyond, the collection equipment. Where located ahead of the collector and heavier abrasive material is carried, a more heavily constructed fan should be used to resist the abrasion. Where located beyond the collector, the main consideration should be the high operating efficiency rather than ability to resist abrasion. Where gases, fumes and vapors are concerned, lighter constructed fans may be used having a high efficiency. In all cases where explosive or inflammable matter is carried through the fan, the impeller must be of non-ferrous material to eliminate the possibility of sparking. In addition to this, the fan housing should be properly grounded to a permanent ground.

The fan manufacturer's tables are usually sufficient for the proper selection of the size of motor necessary under design conditions. The power required is dependent upon the total pressure in inches of water throughout the whole system, the volume of air in cubic feet per minute and the mechanical efficiency of the fan. If it should be necessary to figure or check the required brake horse power the following formula may be used:

$$\text{CFM} \times \text{TP}$$

$$\text{Brake Horse Power} = \frac{\text{CFM} \times \text{TP}}{6356 \times \text{ME}}$$

where

CFM = Cubic feet of air per minute

TP = total pressure in inches of water

ME = mechanical efficiency of the fan.

The latter may vary from 50 to 70 per cent in various types and makes used commonly for exhaust systems. The fan manufacturers can supply information relative to the mechanical efficiency of any particular fan.

Hoods in Collecting Systems

Hoods are provided in an exhaust system for the purpose of entrapping or collecting the harmful dusts and fumes and to prevent them from reaching the breathing zone of the employees. Selection is generally pretty well established, but there are some cases where proper hood design has not been provided. A few general rules for design of hoods may be listed as follows:

1. Enclose the process as much as possible.
2. An exhaust hood which does not enclose the process should be placed with its opening as close as possible to the point of dust or fume generation, since the air velocity in the zone of hood influence decreases approximately as the square of the distance from the face of the hood.

3. Shape the hood to conform to the shape of the area of the hazard producing medium.

4. Flange and baffle the hood if necessary, and where it is possible, to reduce the flow from ineffective areas.

5. Locate the hood opening, or part of it, so as to receive directly any dust that is thrown off along a regularly defined path and thereby utilize the directional energy of the material for its own capture.

6. Locate, wherever possible, the outlet from the hood to the exhaust pipe at a point where the dust will naturally be thrown into it.

7. For all grinding wheels, construct the hood so that it will withstand the shock of a bursting wheel. Bulletin No. 527 issued by the Bureau of Labor Statistics of the U. S. Department of Labor contains detailed data on such construction.

Tank Hood Design

In connection with plating and dipping tanks it is a common and highly commendable practice to use manifold or side type hoods on each side of the tank to draw the fumes from the surface of the liquid through slotted openings. Dimensions which have been found acceptable for such hoods and which were developed by the International Harvester Company are as follows: (Fig. 4.)

1. Width of slot opening (each side of tank) $\frac{1}{4}$ inch per foot width of tank, with a lip at the top extending slightly over the tank edge.

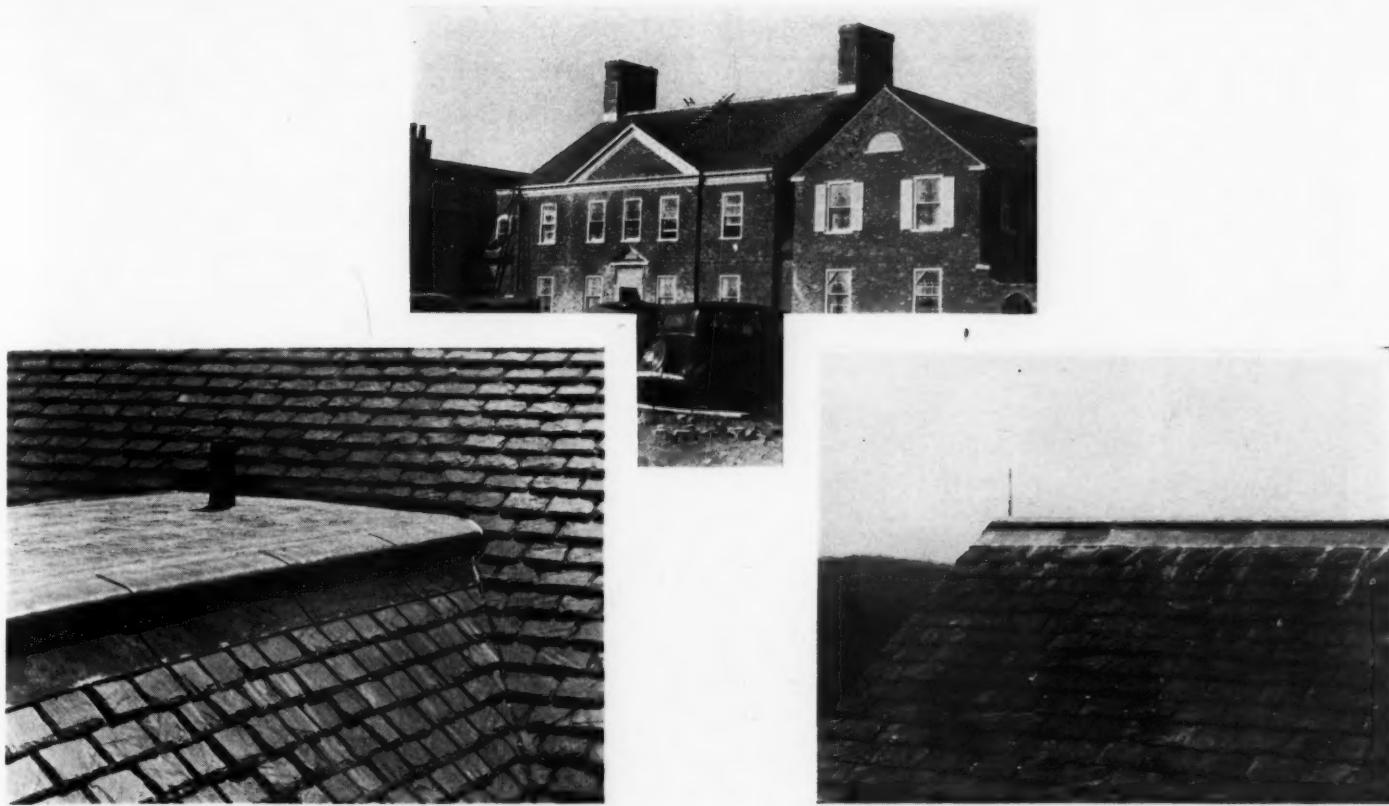
2. Taper the manifold duct with a depth at the shallow end (away from the fan) equal to $1/12$ of the width of the tank and a depth at the exhaust end equal to $1/6$ of the tank width.

3. Area of exhaust pipe from manifold equal to at least the area of the slot with a suction of 2 inches in the pipe.

4. Face velocity through slot from 2000 to 3000 feet per minute.

In conclusion, the layout of machines and provisions for future expansion might be briefly cited. The machine layout is a vital point in the simplicity and cost of the system. If machines are badly arranged, an unsymmetrical arrangement of duct work is necessary, and difficulty is encountered in obtaining proper suction and air flow. New plants can and should be arranged to provide the best conditions for dust control. In existing plants, a similar rearrangement is also desirable and should be provided as far as is consistent. Where widely scattered machines must necessarily obtain, it is desirable to group the machines and provide unit fans and collectors for each group.

There are also too many occasions where systems which are designed for a certain number of machines are expanded to include others, without regard for the original design, and the efficiency of the over-loaded system is thereby greatly reduced. In the majority of cases also, these additions are made at the most remote point from the fan which aggravates the situation even more. Better practice is to provide an independent line from the collector to the new machine.



Copper Flashing on a Slate Roof

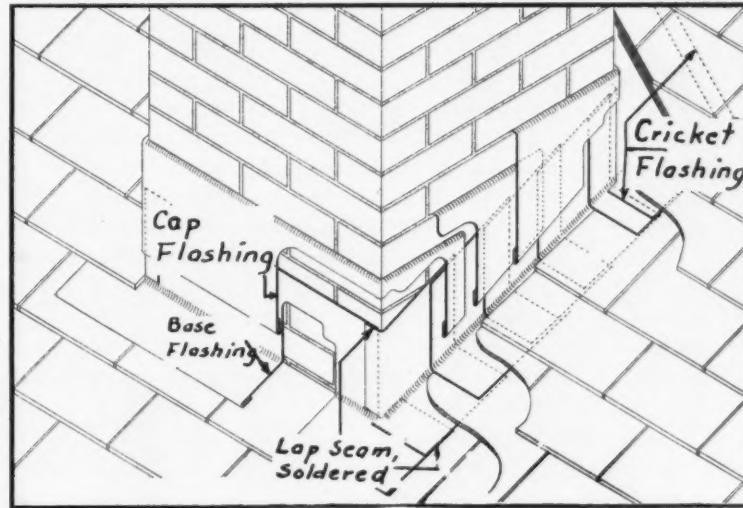
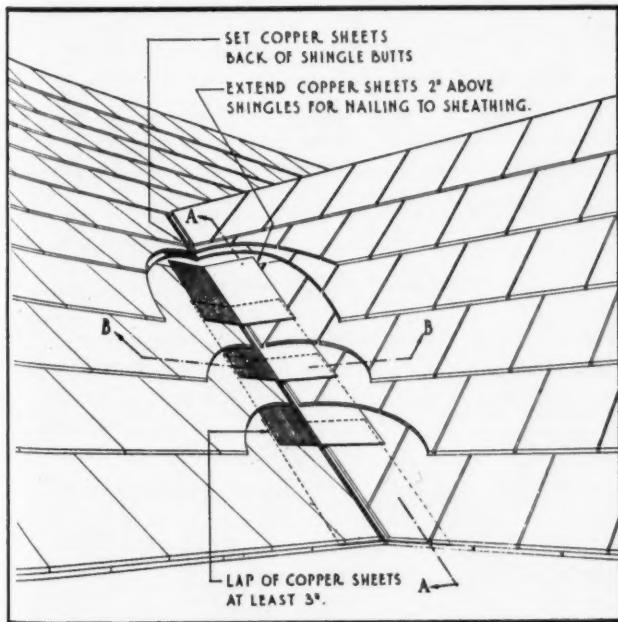
By R. C. Nason

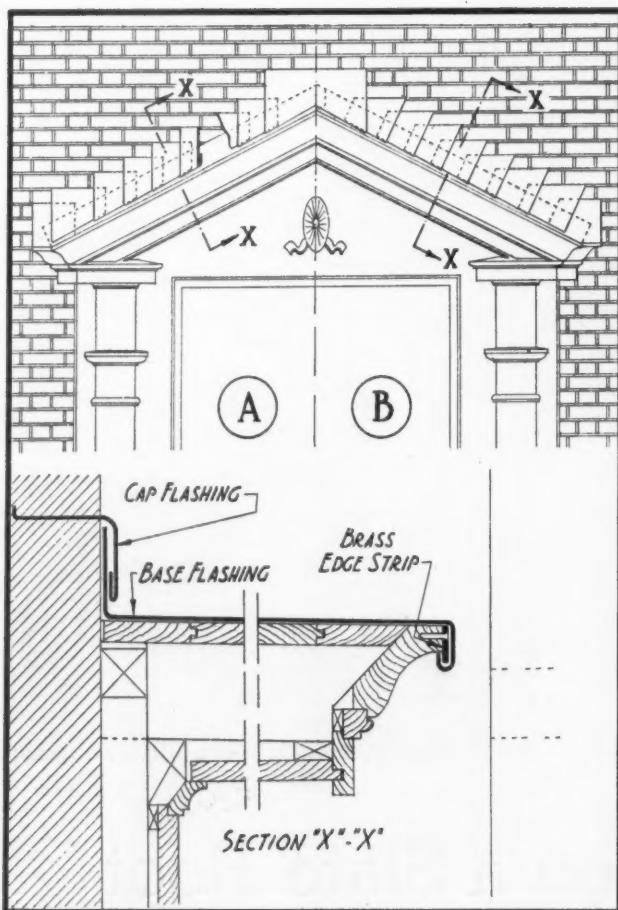
SHEET COPPER in combination with slate roofing has long been considered a perfect combination for a long lived, beautiful roof. A splendid example which illustrates the finished result is the recently completed contract of Benjamin Riesner, Inc., New York City sheet metal contractor, in connection with a new, large, suburban residence

for a local millionaire. Main roof areas were covered by this contractor with Pennsylvania rough black slate, sheet copper also was employed liberally as a seal at numerous points vital to roof tightness.

For example, over 400 linear feet of ridge capping was laid by this contractor using leadcoated,

The two details below (from "Sheet Copper") show methods used by Riesner to flash the chimneys and the concealed gutter. The photographs above picture the finished result.





Unusual methods were used on this house to secure protection against water penetration. Copper and lead were selected to match the long life of the heavy slate. Even such locations as door and window lintels were completely flashed in metal. The detail shows method of flashing the entrance doorway pictured opposite.

16-oz. copper. Flashing was of the same basic sheeting, although not leaded and two flat decks were similarly treated. In fact, copper and lead, the latter for leader goosenecks, etc., were the only two metals used externally.

Flashing Details

The sheet metal contractor exercised unusual care in connection with the flashing. Valley work was entirely concealed, chimney flashing extended entirely through brick work, column heads were flashed as also were window heads. An accompanying illustration shows flat seam treatment of a 20 ft. by 10 ft. deck between masters' and servants' divisions of the building. Copper pieces used were 14 by 20 inches, joined with soft solder. There is an overhang of 2 inches directly above pitched roofing. All gutters and leaders were also of copper. Mr. Riesner's contract involved 3 tons of this material.

Factors Effecting Stoker Satisfaction

(Continued from page 51)

or less, and the minimum rate at which our stoker can fire is such as to deliver 200,000 Btu per hour, then we see from our graph that stoker firing at this higher rate will be more efficient, instead of less, than hand firing at a capacity of 100,000 Btu or less.

Because extremely cold weather is a very small per cent of the heating season, the condition first mentioned does not greatly affect the average efficiency of stoker firing as compared with hand firing, and this average efficiency is found to be generally higher. We should, however, avoid using the highest capacity of the stoker when it is not needed. We should, instead, take advantage of the fact that a stoker has usually three operating speeds and use them in accordance with the heat requirements.

We have already explained that in a conversion job we are bound to fire at a higher rate when a stoker is installed because the stoker is not firing continuously. The greater inherent efficiency of stoker firing may be somewhat reduced by a lower heater efficiency if the stoker is run at a high rate of firing and whether there will be a net gain or not depends upon the way we run the stoker and upon the operating characteristics and reserve capacity

of the heater. If the heater was already being hand-fired close to its maximum capacity in average cold weather, then we may expect little or no saving in coal consumption by stoker firing, because the efficiency drops sharply as the maximum capacity of a heater is approached.

This fact is worth considering when selling a stoker. One of its greatest appeals to the customer is the established fact that a stoker usually saves coal, and if he is disappointed in this respect trouble is likely to develop for the dealer whether he made definite promises of saving or not. It should be clear that the size of the heater is no criterion for the choice of the stoker size in a conversion job, in the sense that for a given heat loss from the building an undersize boiler will require a larger stoker instead of a smaller one.

Furnace Must Be Inspected

Another factor in determining the economic results of a stoker installation is the condition of the heating system. This may be satisfactory for hand firing, but it does not follow that it will be so when a stoker is installed. A steam system may not have sufficient venting capacity to discharge the air at the higher rate at which steam is generated by a stoker-fired boiler. A vapor-vacuum system may require better venting of the mains and more effi-

(Continued on page 106)



Immediate Stock Shipment of Sheets . . . and all other Steel Products

• You'll save time, trouble, and money by concentrating all your steel requirements with Ryerson. Large and complete stocks of bars, angles, channels, rivets, welding rods, sheets, etc., are on hand for Immediate Shipment. All Ryerson steels are of high, uniform *certified* quality, yet they cost no more. Up-to-date cutting and forming equipment and special handling and dispatching facilities assure prompt shipment of every order, large or small.

Ryerson sheets (there are more than 25 different kinds) are all prime quality, accurate to gauge and size, and are specially selected for finish and flatness. They are stored in heated, air-conditioned warehouses to preserve inherent qualities. No seconds are ever carried.

If you do not have the current Ryerson Stock List, we will gladly send a copy. Joseph T. Ryerson & Son, Inc. Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

Principal Products Include—

Sheets (over 25 kinds all certified prime quality)
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Stainless Steel
Strip Steel, Flat Wire
Rivets, Bolts, Nuts, Washers
Welding Rod
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Structurals
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DON'T OVERLOOK *the Hospital*

Big opportunities for sheet metal work in U·S·S Stainless Steel



IN THE BAKERY SHOP, sinks and working surfaces of U·S·S Stainless Steel mean cleaner conditions. Worthwhile orders for the metal worker.



IN THE MAIN KITCHEN, soup kettles and serving counters of U·S·S Stainless Steel. Profitable business for the fabricators.



IN THE LABORATORY, cabinets and tables of U·S·S Stainless Steel, the most serviceable metal obtainable, where sterile surfaces are needed.



IN THE VEGETABLE WASHING ROOM, sinks, working surfaces, pipe covers, and tubs of U·S·S Stainless Steel. Fabricated to fit available space.



STAINLESS STEEL

AMERICAN STEEL & WIRE COMPANY, Cleveland, Chicago and New York

CARNEGIE-ILLINOIS STEEL CORPORATION, Pittsburgh and Chicago

NATIONAL TUBE COMPANY, Pittsburgh

Columbia Steel Company, San Francisco, Pacific Coast Distributors

Scully Steel Products Company, Chicago, Warehouse Distributors

United States Steel Export Company, New York

UNITED STATES STEEL



Past President Vander Waals hears some problems. Left to right—Ed. Anderson, Phillip McCabe, Arthur Lendville, Peter Vander Waals, D. G. McCauley, Allen Foy.

Michigan Ass'n. Changes Name and Sets Up a Separate Heating Division

AMOST important and far-reaching change was effected in the organization of the Michigan Sheet Metal and Roofing Contractors Association at the March 5, 6 and 7, 1940, annual convention. The name of the association was changed to the Michigan Sheet Metal, Roofing, Heating and Air Conditioning Contractors Association but, more important, the association was reorganized to include a new and separately functioning division for contractors mostly engaged in heating and air conditioning.

According to the new constitution, each such divi-

sion may—"formally organize, adopt by-laws, establish and elect a Board of Managers and other necessary official personnel, collect and administer funds for special purposes, establish beneficial activities and policies, employ legal and other help when necessary and generally carry on as a separate association except that all such by-laws, organization plans and activities shall not be in conflict and must be submitted to and approved by the Board of Directors of the association. The an-



Newly elected President for 1940 Glen Rynbrand of Kalamazoo.



Frank Ederle, secretary of the association for many years and recipient of a tribute prepared by members.



Left to right—Peter Vander Waals, Secretary E. C. Spraker, Bill Sullivan, Ed Hall, at the banquet.

nual convention of each such division shall be held at the same place and during the same time as the annual convention of the association."

This change in the constitution was brought about because formerly the activities of heating and air conditioning were not as thoroughly recognized as the divisions of sheet metal and roofing and since heating and air conditioning is becoming an increasingly important activity of firms operating in Michigan, it was considered advisable to make the change outlined. To effectuate this change, officers and directors were elected for the state association and a chairman, Henry Delnay, was elected for the heating division.

A number of important changes were made in

A FRIEND

*A FRIEND is one
Proved tried and true
In prosperity and depressions.
A FRIEND is one
Always loyal to you
Regardless of possessions.*

*You may be rich,
You may be poor
And suffer retrogressions;
His love and trust
For e'er endure,
Our dearest of possessions.*

While realizing that the above cannot, even with plenty of poetic license, be called poetry, nevertheless, we, the undersigned, jointly and severally aver that it does, though inadequately, set forth some of the essential qualifications of a friend and further, we jointly and severally agree that our friend of long standing,

FRANK E. EDERLE

fills said specification in full. Frank, while you are still among us, we want you and all of the sheet metal, roofing, heating, air conditioning and other allied industries of North America to know that we sincerely appreciate the privilege of your friendship, we appreciate your lifelong unselfish devotion to their related industries and your fine record of service and accomplishment as Secretary of the Michigan Sheet Metal & Roofing Contractors Association.

Sworn to and subscribed this 7th day of March, A. D. 1940 in the Olds Hotel, Lansing, Michigan.

"Bill" Busch "Bill" Sullivan "Tom" Marshall
"Al" Bersbach Jay Biddle

And hosts of your other friends, not consulted, but subscribing in spirit.

the revised constitution. As to membership—"Any local association which maintains 100 per cent membership in any division of the association and whose constitution or by-laws has been approved by the Board of Directors may be granted a charter. In that event all membership in this division from such a locality must come through the local chapter. Any person or firm engaged in retail sheet metal, roofing, heating or air conditioning in Michigan where there is no local association charted or the division in which the said party naturally belongs said contractor or firm may make written application for membership in one or more of the established divisions. Membership dues in any of the divisions shall be paid into the treasury of the association. In case of membership in more than one division, the member shall pay dues into the division which maintains the highest due rate. Each established division of the association shall be entitled to elect an equal number of directors at large and the number of directors at large shall be determined by the number of established divisions, providing that the numbers elected shall at no time exceed a total of ten directors."

Tribute to Frank Ederle

In tribute to Frank E. Ederle for his many years of activity with the association, a tribute was prepared and presented and adopted by the association. This tribute to Mr. Ederle is reproduced in an accompanying column. The association authorized the secretary to send flowers and a telegram wishing for the speedy recovery of Adam Schepper, convalescing after an operation. Mr. Schepper is one of the old-time members of the Michigan association. The association also elected as a life member Joseph C. Van Rossum of Grand Rapids,



Secretary for 1940, E. C. Spraker of Grand Rapids.



The Grand Rapids group listens to a story (with gestures) by Dewey Doyle.

second president of the association in 1912 and the oldest living past president.

Air Conditioning Problems

A. J. Nydham, Richards Mfg. Co., declared that the thing which keeps contractors coming to conventions year after year is the common problems of our industry and the help which comes mainly from convention discussion.

Associations, declared Mr. Nydham, are the focal points for contractors' activities. Local associations tie into state associations and state associations into National organizations. But the problems which confront any given contractor are local problems and he can not be too enthusiastic about problems far removed from his zone of operation. The problem of each contractor is to enlarge his zone of operations up to the point where his business is profitably feasible. The wise contractor will endeavor to cover a territory large enough to provide the necessary volume to maintain his operations but will not try to extend his operations beyond the ability of his organization to handle work contracted. To wise management must be attached good salesmanship and to be a good salesman a contractor should be presentable, must have character, should have ability and above all must be persevering.

One of the things each contractor should learn early in his business career is to stop worrying about his competitor and to stop trying to figure out how the competitor manages his business or how much money he makes. Even though the contractor finds out all these things, the information is of little importance because every contractor has to map out his own sales campaign, know his own cost and overhead and be willing to work hard for a reasonable profit. To these qualities should be added association mindedness. Only by organizing can an industry establish an idea, only as an industry organizes can that industry hope to secure its fair proportion of the consumer's dollar. Association co-operation provides, also, the means to combat trends detrimental to the industry. As an example, Mr. Nydham pointed out that since the public demands cheaper and cheaper prices, manufacturers tend to reduce capacity or quality to meet this price and only through contractor organizations can these trends be prevented.

Toledo's Heating Code

Henry C. Bitter, Secretary of the Toledo Sheet Metal & Roofing Contractor's Association, declared that direct experience with a gravity and mechan-

(Continued on page 100)



Left to right—T. W. Clark, Bob Convery, Bill Schwein, E. C. Henry, Steve Horvat, C. Symmons.



Left to right—J. C. Harden, Charles Pearson, H. J. Somers, Henry Trumbull, G. D. Heeringa.

Small Homes Campaign of FHA

FHA has announced a comprehensive campaign to stimulate construction and sale of small homes. A very essential part of the campaign is the material offered free to financing organizations, builders, general and sub-contractors. FHA hopes that all these agencies will cooperate by making wide use of the material offered and explained in this article.

"SMALL HOMES," a subject of big importance in 1940, will occupy the attention of the building industry this spring in the nation-wide campaign to tell the country's prospective home



This folder gives a simple explanation of how the FHA plan can aid a family of moderate income to own a home. The folder is to be distributed by contractors and dealers and may be obtained from FHA.

owners how an attractive modern home can now be bought and paid for on an average income.

The campaign with the full support of the Federal Housing Administration opened simultaneously in all sections of the country the latter part of February. The theme of the new program is "Your family can own a home like this"—an attractive small home which can be bought for about \$25 a month or less. The appeal is aimed directly at the vast market of potential home buyers whose incomes demand a housing budget of a dollar a day or less.

Expected Distribution

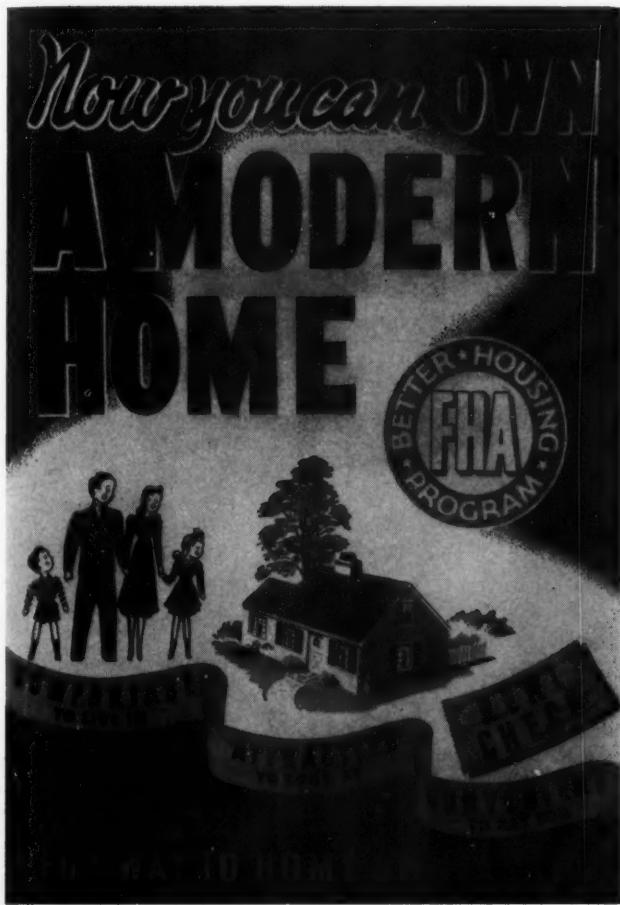
It is expected that manufacturers, dealers, realtors, builders, lending institutions and contractors will release special promotional pieces based on this theme. To support these efforts, the Federal Housing Administration has prepared new material, including window displays, folders, suggested newspaper advertising, radio talks and transcriptions, a motion picture short, car cards, etc.

Both the display material and literature are available to all dealers who want to be identified with the national small homes program, but it will be sent only on direct request. Quantities are limited, and it is a matter of "first come, first served" in filling requests.

Window Display Pieces

The window display pieces are designed to be used separately and may be adapted to varied needs and display facilities of individual dealers. A one-sheet poster printed in red, dark blue, light blue, and green bears the legend, "Now You Can Own a MODERN HOME—Comfortable to live in, Attractive to look at, Convenient to pay for." Colorful triangular display pieces picture attractive small homes with the captions, "A Home to Suit Your Income," "Convenient Payments Like Rent." Two small streamers printed in color complete this adaptable set of window material which will enable dealers, contractors, and others to create attractive displays built around their own products or services.

Newspaper Ads and Folders



Printed in red, blue, green, this one sheet poster is for display in windows or interiors. The poster is part of window set No. 10 or may be obtained separately. Size 28 by 37 inches.

In all this material the word "Small" is not emphasized in connection with these homes. The emphasis is placed on an attractive, convenient, *modern* home which can be paid for conveniently with small monthly payments.

Specimen newspaper advertisements repeating the theme are also prepared by the Federal Housing Administration for dealer use. These are mailed in proof form to local newspapers who will be supplied with mats of the art work on request.

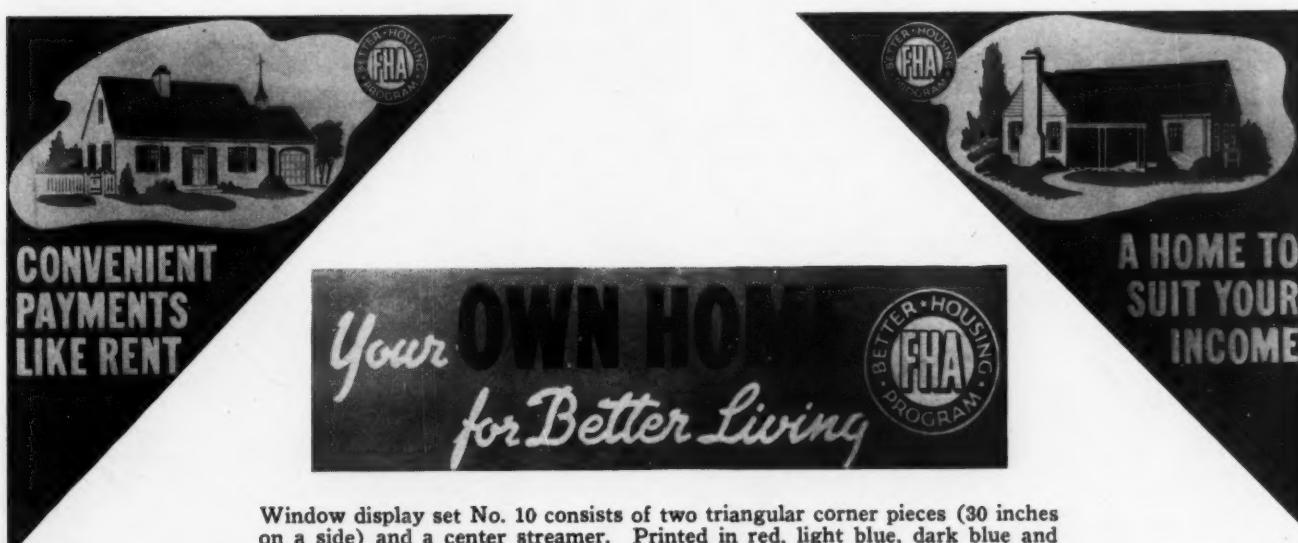
A folder for distribution by contractors, dealers, and salesmen to prospects in the store, home, and elsewhere repeats the basic message, "Your Family Can Own a Home Like This—\$25 a month." Printed in attractive colors, it explains briefly how a family of moderate income may own a home with a small amount down and monthly payments of about \$25, including principal payment, interest, taxes, and insurance.

Special radio programs are being arranged locally by all State and District offices of FHA. In addition, manufacturers, dealers, and others will be provided upon request with scrips and commercial announcements by which they may tie in their own merchandise or services with the small homes campaign.

Technicolor Movie

A new Technicolor movie, "Homes of Today" pictures attractive small homes and offers dramatic proof of what the average family may obtain today in design, construction, and financing terms. This film is being released to local theatres and will continue to be shown during the spring building months. Local theatre exhibitors should be consulted for information about dates of showings.

In the new FHA material no particular distinction is made between the regular insured mortgage and the newer Class 3 loans up to \$2,500. Either plan is suitable for small-home financing, and any lending institution making FHA-insured loans will be glad to cooperate with contractors who are active in finding prospective owners of small homes.



Window display set No. 10 consists of two triangular corner pieces (30 inches on a side) and a center streamer. Printed in red, light blue, dark blue and green. The set can form an attractive frame for equipment displayed in the window. May be obtained free from FHA.



President-elect for 1940, George Ballard, of Rochester.

IN the midst of the worst winter in a generation, with many up-state New York cities completely snowed in, the New York State Sheet Metal, Roofing, and Air Conditioning Contractors Association met in the seventeenth annual convention in Utica March 26 and 27. Despite the weather, attendance was representative; manufacturers and distributors of products staged an interesting display of equipment; and progress was made on several important business problems confronting the association.

Some progress was made toward accomplishment of group insurance with a minimum of \$50,000 per annum in premiums which, if organized, can effect an immediate reduction of fifteen per cent in premiums paid and possible additional dividends of from 20 to 40 per cent, according to the experience of other groups reported by members of the insurance committee.

The Merchandisers Auxiliary, formed at the 1939 convention, reported some progress in its membership campaign among salesmen. As expressed by Jack Stoner, second vice president of the auxiliary, the auxiliary's basic purpose is to increase membership in the New York Contractors' Association. Mr. Stoner read excerpts from the auxiliary by-laws and made some recommendations for future co-operation in providing entertainment, programs, etc. The auxiliary recommended that some central New York State city be selected for the annual convention each year in order to make it easier for contractors to attend.

At the second day's luncheon, to which Utica engineers and architects were invited, Thomas F. Holden of the F. W. Dodge Corporation, New York City, presented an analysis of anticipated business in the construction industry for 1940. According to Mr. Holden, some activities will see a drop in

New York's 17th Annual Convention

volume (noticeably government subsidy programs), whereas private construction—residential, industrial and commercial—should show an increase in 1940. The overall increase in all forms of building construction, according to Mr. Holden, should work out at roughly 11 per cent increase over 1939 volume. Excerpts from this address, covering construction pertaining to our particular field of activity will be published in a later issue.

FHA Specifications

Roy S. Smith and D. Erdman of the Albany office of FHA presented a brief analysis of the aims of FHA for 1940 and discussed the rules and regulations of FHA which apply to warm air heating, residential air conditioning and sheet metal application on FHA guaranteed loan houses. According to the speaker, FHA will continue to offer the best cash business outlook of any government agency touching the warm air heating-sheet metal field and explained the basic divisions of FHA—one division covering remodeling and modernization and the other covering new construction. They announced that up-to-date more than 10 million persons had applied for remodeling or modernization loans.

Mr. Smith said that all government agency surveys indicate that the big need now is for houses for a man earning approximately \$1,000 and the man earning approximately \$2,000 to \$2,500 per year. This particular field, insofar as the warm air

Below—First Vice-President-elect, for 1940, Joseph Lindacher, of Utica.



heating-sheet metal industry is concerned, calls for radical revisions in the types of heating systems installed. Mr. Erdman, Albany office architect, outlined briefly some of the construction rules which govern the installation and design of warm air heating equipment, air conditioning equipment and sheet metal work on all types of FHA houses. Mr. Erdman read excerpts from these rules and regulations and said contractors should obtain copies from their local FHA office. The speaker declared one interesting development in 1939 was the use of thin, low-cost slate for low-cost house roofs. Mr. Erdman also announced the establishment of a technical division of FHA in Washington which is undertaking the testing of all equipment used in FHA houses and also installation practices, governing this equipment. The speaker assisted in clarifying a number of controversial regulations governing the design and installation of gravity and mechanical warm air heating systems in all types of houses as presented from the floor.

Sales Potentials

Speaking on "Trends in Equipment Handled by Contractors and Sales Potentials," J. D. Wilder, AMERICAN ARTISAN, explained how a contractor can establish his sales potential from figures commonly available in most cities. New house construction figures, as reported by F. W. Dodge Corporation, can be used to establish the new house potential. Real Property Inventory figures and other more recent surveys establish that among existing warm air heating plants approximately one plant in every four needs replacement or will provide more efficient heating if replaced, so that if the number of fur-

Right—Dr. Paul Douglas (Rising & Nelson Slate Co.) described slate as a roofing material practically without fault. Contractors agreed, but disagreed with some of the sales policies of slate manufacturers.

Right — Merchandiser's Auxiliary Vice-President Jack Stoner read excerpts from the organization's by-laws and offered the whole-hearted support in a membership drive in 1940. 1939 President Burton Stevens, presiding.



Left—I. C. Barber (International Heater Co.) said warm air heating in less than twenty years had grown from a "cheap" method of heating to a scientific method — the first choice of 90 per cent of owners and builders. "If we are to hold this prestige everyone in the industry must join hands in publicizing warm air—air conditioning's advantages."

naces in a town are known, one fourth of these furnaces can be counted upon as replacement. This figure must be further reconciled by selecting an arbitrary percentage (such as ten percent) of these one in four furnaces as the market which can be sold in any one year. Roughly this gives the average furnace a life of somewhere between thirty-four and forty years, which is generous. Adding new house potential and replacement potential together establishes the market which can be anticipated by all of the contractors operating in a given locality.

Mr. Wilder then showed figures which indicate that in warm air heating, as in many other fields, approximately 20 per cent of the contractors engaged in a locality do approximately 80 per cent of the total volume of that locality. If the potential new and replacement market is compiled and the contractor knows whether he is a "20 percent contractor" or "80 per cent contractor" it should be possible to anticipate approximately the volume of business which he can do in a given year.

The speaker also showed figures indicating changes in equipment handled by contractors in over 100 cities. These figures indicate that a great many manufacturers are not represented by "key" dealers in important trade centers and, furthermore, that among the leading manufacturers represented in all cities, only ten manufacturers have volume



Left—Roy S. Smith (seated and architect Erdman standing) of the Albany office of FHA explained the FHA program and discussed FHA regulations applying to heating systems, roofing and sheet metal work.





Left—L. L. Williams (Bird & Son Co.) declared that heating men design a system first and price it afterwards, but roofers price the job first and design the roof later. He also made a plea for understandable proposals (see text.)



Right—George Boeddener (Nat'l Warm Air Ass'n) described the association's "Yardstick," a consumer booklet soon available, which evaluates "Good," "Acceptable" and "Poor" installations by means of drawings.

representation in one-fourth or more of the cities surveyed. These same figures also indicated that there is a surprising change in equipment handled by these "key" dealers. The figures indicate that some manufacturers have a dealer turnover of approximately 50 per cent per year while other manufacturers' turnover varies from 10 per cent to 20 per cent per year.

N.W.A.H.&A.C. "Yard Stick"

George Boeddener, Assistant of the President, National Warm Air Heating and Air Conditioning Association, discussed the new plans of that association for 1940 which briefly include a drive to increase contractor membership in the association and a general broadening in many of the activities. The speaker briefly outlined the history of the National Warm Air Heating and Air Conditioning Association; outlined its research program at the University of Illinois and allied laboratories; outlined the formulation and acceptance of the Standard Gravity Code, the Practical Code and the Technical Code for mechanical warm air heating; and asserted that the present day acceptance of warm air heating and air conditioning can be traced directly to the activities of the National Warm Air Heating and Air Conditioning Association through its research program.

Mr. Boeddener then described such recent activities as the publicity program and, of much interest to all of the contractors present, announced and explained the "Yardstick" booklet which will be ready for distribution early in May. Mr. Boeddener ex-

plained that this is a consumer booklet designed to be given to the home owner, also to architects or engineers or builders; and is intended to be a means whereby the customer can evaluate the type of heating system proposed by the contractor. The booklet will explain briefly what warm air heating and warm air-air conditioning are, what are the basic requisites for a satisfactory warm air system and will then show by means of detailed sketches what constitutes good, acceptable and poor design and installation practices. Such important things as furnace foundations, plenums and plenum connections, trunk and branch pipe construction, branch take-offs, trunk and stack turns and connections and fittings, location of registers and returns, return air construction, will be shown as good, acceptable and poor practice by means of sketches. Mr. Boeddener announced that full information on how these booklets may be obtained by contractors can be secured from the National Warm Air Heating and Air Conditioning Association offices, 5 E. Long Street, Columbus, Ohio, or from the manufacturers whose equipment the contractor handles.

Problems of Warm Air Heating

Two interesting discussions were presented on the general problems in warm air heating. I. C. Barber, International Heater Company, reminded



Left—Carter S. Cole (Copper & Brass Research Ass'n) said copper was an enduring material, but trying to reduce application costs and downright ignorance were causing some improper practices which, if left alone, can quickly "kill" all use of copper as an exterior material.



Right—Professor Lorin Miller (Michigan State College) invited the audience to "take their hair down" and discuss some ticklish problems of heating. The result (see text) aired a number of problems under argument.

contractors that in less than two decades they have seen warm air heating advance from a "cheap" system to an acknowledged science and the leading, acceptable method of residential heating and air conditioning. He outlined briefly some of the highlights in this progress such as the establishment of the Research Residence in Urbana, the compilation of codes, the coming of blower systems, and pointed out that no other industry has done as much research work or spent as much money on research as has the Warm Air association and the warm air heating industry. Mr. Barber asked why the warm air heating industry continues to permit new firms and organizations with very little background in warm air heating to usurp the place which rightly belongs to the established warm air heating manufacturer and warm air heating contractor. Mr. Barber suggested that the entire industry should begin immediately to make known to every bank, building and loan association, architect, home builder, all of the advantages of this warm air heating science as we know it today. If the industry will do this, declared Mr. Barber, the progress made to date which seems phenomenal will seem small by comparison.

Trends In Warm Air Heating

Professor Lorin G. Miller, Department of Mechanical Engineering, Michigan State College, East Lansing, Michigan, speaking on "Trends in Forced Warm Air Heating" asked contractors to remember that the so-called development in winter air conditioning is not a spectacular development, but the result of many years of progress in a science of han-

ency to use too small a filter area in the blower cabinet and to pass the air through the filters at too high a velocity for satisfactory dirt removal. Another problem of present day design brought about by the demand for smaller units, results in air flow through the furnace casing at too high a velocity for efficient heat pick-up, and also results in higher than advisable furnace casing resistance. Prof. Miller declared some research should be made on casing resistance and casing air flow velocities in order to increase the efficiency of the overall installation. Under capacity of air volume as recorded at registers may be due in many cases, declared Prof. Miller to resistances in the furnace casing far beyond the resistance suspected by the manufacturer.

Prof. Miller declared that he believes the controversy over high side wall vs. low register locations is just an argument and that engineers may never be in agreement on the proper location. Both high side wall and baseboard locations are satisfactory if air volumes and air velocities are handled properly and if the contractor knows the limitations and requirements of each location. Prof. Miller went into some detail regarding satisfactory velocities and volumes from both register locations and pointed out the importance of air throw and air dispersion from registers of both types. This discussion was actively entered into by numerous contractors in the audience with the result that no final decision was made (as might be expected) but some very important data were brought to the attention of the audience.

As to the location of return grilles, Prof. Miller

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AUXILIARY OFFICERS

President—A. A. Stagg—U. S. Register Co.
1st V. P.—Jack Stoner—American Brass Co.
2nd V. P.—C. E. Clifford—The Kent Co.
Treasurer—F. O. Carfer—Wheeling Corrugating Co.
Secretary—C. H. Lighthart—Mfg'r's. Sales Engineer.
Sergeant—A. C. Detmers—J. M. & L. A. Osborn Co.

DIRECTORS

L. P. Doty—Follansbee Bros. Co.
Rob't. Milholland—Fox Furnace Div.
P. B. Andrews—Revere Copper & Brass, Inc.
A. E. Kirchgraber—J. M. & L. A. Osborn Co.
J. Howard Riddle—Milcor Steel Co.

dling heat and air. Present day warm air heating equipment is the result of the failure of stoves and radiator heating; fans became acceptable because contractors and home owners wanted to control air flow, gravity furnaces were succeeded in popularity because high register temperature was not completely satisfactory and contractors wished to control both temperature and air volume; accumulation of dirt within houses and the circulation of this dirt by both warm air and radiator types of heating brought the filter and filtering.

In connection with this problem of filters, Prof. Miller declared that there seems to be some tend-

declared that inside wall locations generally shortened up the return air system thus decreasing resistance and within his experience seemed to be more satisfactory than trying to locate cold air returns along outside walls, necessitating long return air systems and high resistance.

Returns from second floors are also a cause for argument which can not be settled and must be decided by the individual contractor according to the peculiarities of the house under consideration. Second floor returns can be made to work satisfactorily but may not be economically feasible due to

(Continued on page 96)

New PRODUCTS

For your convenience a number has been assigned each item. Circle the items in which you are interested on the coupon on page 118 and mail to us.

● Indicates product not listed in 1940 Directory.

△ Indicates manufacturer not listed in 1940 Directory.

43—Climate Changers

The Trane Company, LaCrosse, Wisconsin, announces that their line for 1940 has been redesigned and refined to incorporate late developments. All Trane Unit Coolers and Air Conditioners are now included under the designation—Trane Climate Changers. Five major types possess a diversity of application possibilities as well as capacity range from 250 to 20,000 cfm.

Type D for a wide variety of applications ranges from small horizontal and vertical models for hotel and office to large commercial units in three



parts capable of delivering a maximum of 20,000 cfm. A wide range of fan and coil capacity is available in various coil combinations for the different types of heating and cooling.

Type A has been designed for apartment house applications and provides heating, cooling, or both, on various systems for the individual apartment controlled conditioning.

Type F is a floor unit with deluxe features and provides year around conditioning for home or office, in a range of sizes and capacities from 250 to 1,500 cfm.

Type M is available in both vertical and horizontal models in various sizes ranging from 1,200 to 12,500 cfm where economy is the factor.

Type X is a propeller type Comfort cooler, for spot cooling, streamlined for attractiveness in shop or office, with capacities from 530 to 2,250 cfm.

▲44—Equalize-Aire

Equaliz-Aire, Incorporated, 1467 Irving Park Rd., Chicago, announces Equaliz-Aire, a new all-year-round room air motion control apparatus.

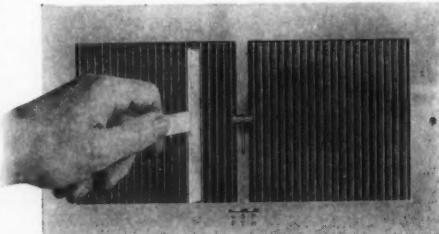
The unit spreads the air in all directions along the ceiling to the four walls and down the walls to the floor.

In summer on high speed, this circuit gives air comfort from air motion. The unit on low speed in winter eliminates temperature stratification, drafty spots and cold floors.

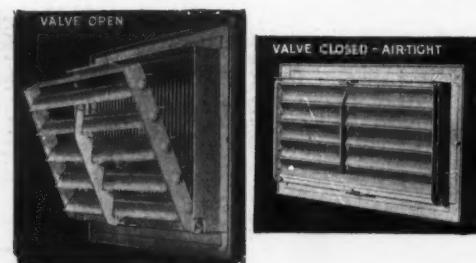
45—No. 75 Register Line

Hart & Cooley Manufacturing Co., Holland, Mich., announces the No. 75

line of registers—flexible fin type with turning blade valve to provide double deflection, also grille without valve.



The No. 75 turning blade valve, providing instant adjustment of air flow from 20 deg. up to 20 deg. down, is



identical with the valve furnished on the No. 86 design register. The required deflection is obtained by simply turning the regulator on the register face to the proper setting with the key.

▲46—Evaporative Coolers

Great National Air Conditioning Corporation, Dallas, Texas, manufactures a full line of Golden Eagle evaporative coolers—1750, 2800, 3800, 5000, 7000, 8000 and 10,000 cfm capacities, blower equipped.



Features are rustproofing of blower and cabinet parts, porcelain enameled pan, non-sagging pad arrangement and cross-tee water trough distributing

method that provides equal water volume to each pad. All sizes are louvre-equipped except the 10,000 cfm, with all louvres inverted.

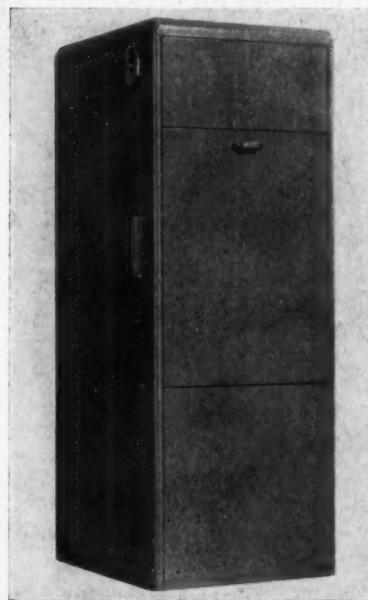
47—Janitrol Line

Surface Combustion Corporation, Janitrol manufacturers, 2375 Dorr St., Toledo, Ohio, announces a complete line of gas-fired winter conditioners.

Outside dimensions of the complete conditioner are small—the 90,000 Btu unit is 58 in. high, 27 in. deep and 22 3/8 in. wide.

The most generally used sizes, 60,000 and 90,000 Btu capacities, are package jobs, shipped completely assembled.

The amplifier type of burner, widely used in the industrial division, has been placed in such form as to make it suitable for the new Janitrol.



A battery of cast iron "Thermex" tubes forms the heat exchanger of the new conditioner, the number ranging from four to twelve. The tubes are approximately 18 in. high with an internal cross-section measuring about 9x1 1/4 in. Integrally cast heat absorption fins are staggered vertically inside each Thermex tube, each fin being 2 1/2 in. long. Integrally cast convectors are used on the outside of the Thermex tubes, these being spaced vertically on 3/4 in. centers, increasing the heating surface approximately 130 per cent.

The burners are placed beneath the Thermex tubes.

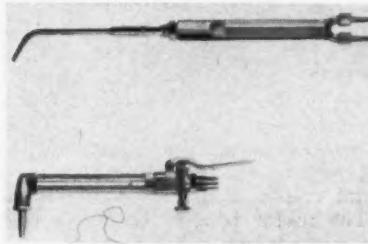
New Products

For your convenience in obtaining information regarding these items, use coupon on page 118.

48—Prest-O-Weld Cutting-Welding

The Linde Air Products Company, 30 E. 42nd St., New York City, announces a new medium-pressure oxy-acetylene blowpipe for welding light-gauge metal, and a cutting attachment for cutting iron and steel up to 1 in.

The blowpipe—Type W-109—is designed for welding light production



Above: The Prest-O-Weld—type W-109—welding blow pipe.

Below: The Prest-O-Weld—type CW-109—cutting attachment.

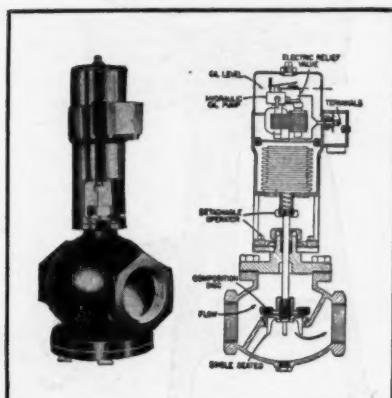
work and in aircraft construction, where metals up to $\frac{3}{8}$ in. in thickness are to be joined. There are eight sizes of welding heads for the W-109, each with an individual mixer.

The Prest-O-Weld—Type CW-109—cutting attachment, for the cutting of sheet metal and light plate up to 1-in. thick, attaches directly to the W-109 blowpipe handle in place of the welding head.

49—Hydramotor Valve

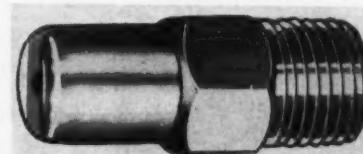
General Controls Co., Glendale, Cal., announces the Hydramotor valve for handling air, gas, water, oil, brine, saturated steam, etc. The new valve is of the full-ported single-seated type.

The electric pilot valve has a simple



two-wire current failure control, with low current consumption. There is one internal switch. The operator is totally enclosed, sealed in oil, and is bathed in oil.

Composition discs in the valve body are furnished to suit the service.



50—Flat Spray Nozzle

Spraying Systems Co., 4021-F W. Lake St., Chicago, has just placed on the market a flat spray nozzle for metal cleaning and processing. Spray is the flat type with slightly heavy center, in a number of different spray angles. Nozzles have $\frac{1}{4}$ -in. male pipe connection. Capacities range from 1.5 to 3.5 gpm at 10 pounds pressure and 3 to 7 gpm at 40 pounds pressure.

51—Replacement Casing

The Char-Gale Manufacturing Company, 3125 Hiawatha Avenue, Minneapolis, announces replacement casings or cabinets, made-to-measure for any size and style of heating plant.



The cabinet is attractively designed, strongly built, and beautifully finished in baked enamel.

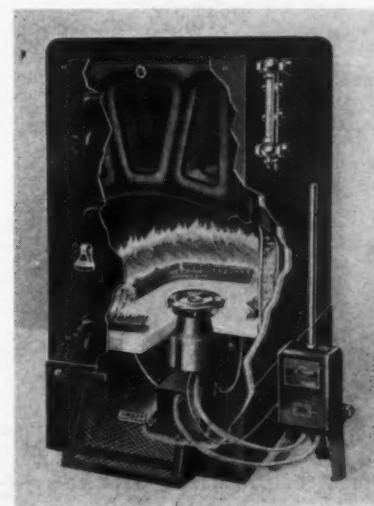
Provision is made for cooling the cabinet with a moving stream of air which also reduces heat loss through the casing and increases efficiency of the heating unit. These cabinets are built with an electric welded leak-proof construction, and are assembled without the use of sheet metal screws. Channels seated in double grooves and interlocking joints effectively seal the casing and provide a permanently noise-free installation.

52—Quick-Heater Burner

Quick Furnace and Supply Company, 210 Court St., Des Moines, Iowa, is introducing the Quick Heater automatic oil burner in three sizes—two, four and six gallons of No. 3 oil per hour. Accessories include Webster two stage pump, Emerson motor, Dongan transformer, Minneapolis-Honeywell controls.

53—Wall-Flame Burner

Timken Silent Automatic Division, The Timken-Detroit Axle Company, 100 Clark Avenue, Detroit, has added a new wall-flame oil burner—Model H—with capacity suitable for six to ten-room homes. A self-lubricated Monorotor is the one moving part. The



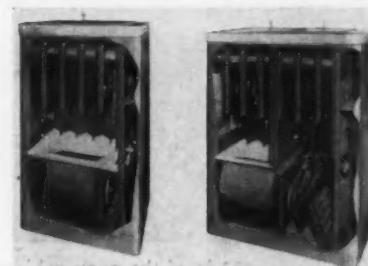
Monorotor spins like a top on an anti-friction bearing and combined with a forced lubricating system makes for quiet operation.

The burner is equipped with the Timken patented chromium steel flame-rim which cuts warm-up time.

54—Gas-Fired Units

The Conco Corporation, Mendota, Illinois, announces their complete new line of automatic gas-fired heating and conditioning equipment—to be marketed in connection with the Conco stokers and oil-fired equipment.

The new line is comprised of three new series of heating and conditioning equipment—gas-fired airconditioners in two models, gas-fired gravity heaters and three gas-fired wall and floor heaters, in a range of sizes to cover



both domestic and semi-commercial installations, all AGA approved.

Models BITD and TITD operate in completely enclosed, tamper-proof cabinets. The heating elements are formed from pressed steel sections welded into a single, rigid piece. An "Automatic Pilot" protects against operation if the pilot light should be extinguished. "Fan and Limit Switch" protects the unit from overheating; a pressure regulator maintains constant gas input under fluctuating pressure.

New Products

For your convenience in obtaining information regarding these items, use coupon on page 118.

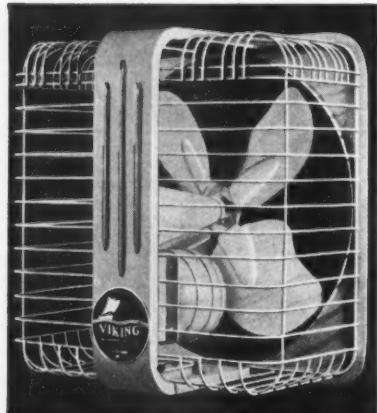
55—Stationary Louvre Ventilator

Milcor Steel Company, Milwaukee, Wisconsin, has designed a new all-steel louvre ventilator for home construction, to provide maximum air circulation, carrying off summer heat and destructive winter humidity. The louvre is made of galvanized, weather-resistant steel and painted.

The wire fly-screen covering the inside can be removed and sheet metal or cardboard slipped into position to prevent the entry of cold air. Four standard sizes are available.

56—122 Window Fan

Viking Air Conditioning Corp., 9500 Richmond Ave., S. E., Cleveland, Ohio, announces a new window fan for comfort cooling, operating on the same principle as attic ventilation by drawing in cool air and expelling accumulated hot, stagnant air.



The Model 122 is of the open cabinet construction. Transparent spacer plates are provided for large windows. It is finished in ivory enamel with modern chrome trim and measures 23½ x 23½ x 15 in. It is equipped with a ½ hp rubber mounted motor.

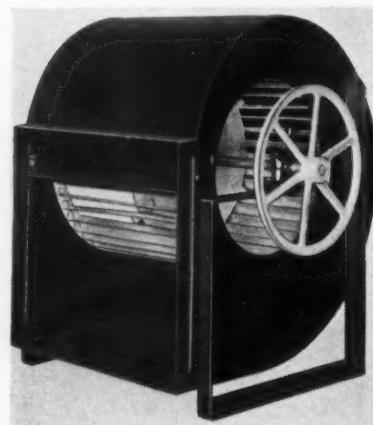
57—A-12 Oil Burner

Delco Appliance Division, General Motors Sales Corporation, Rochester, N. Y., has added Delco Model A-12 to their line of oil burners—with a capacity of 559,200 Btu per hour suitable

for the larger homes. Model A-12 incorporates all the features of the Model A, adding a new oil conditioner—a wool-like absorbent filter in place of the metal strainer to clean and purify the oil.

58—Blowers, Wheels, Housings

Southern Fan & Blower Company, Dallas, Texas, is manufacturing blowers, blower wheels and scroll housings in a range of sizes. Parts are die formed and stamped in a large modern



factory and assembled on mechanized assembly lines. All blowers are statically balanced before shipment, with exteriors finished in baked enamel.

Sizes range from 9 to 54 in. wheel diameter, both single and double inlet.

59—Freeman Stoker

Illinois Iron & Bolt Company, Freeman Stoker Div., 918 S. Michigan Ave., Chicago, announces a new low-priced Freeman stoker with double-action air control; heavy-duty repulsion-induction motor; heavy gauge 300-lb. coal capacity hopper; continu-



ous gear driven transmission; extended windbox; sectional tuyeres with "V" shaped air openings; coal tube and hopper base of welded construction with heavy seamless steel tubing; conveyor screw of special alloy heat-treated steel for longer life; clean-out plate for removal of railroad spikes or other obstructions.

Capacity is 30 pounds per hour.

60—Grinder No. 153

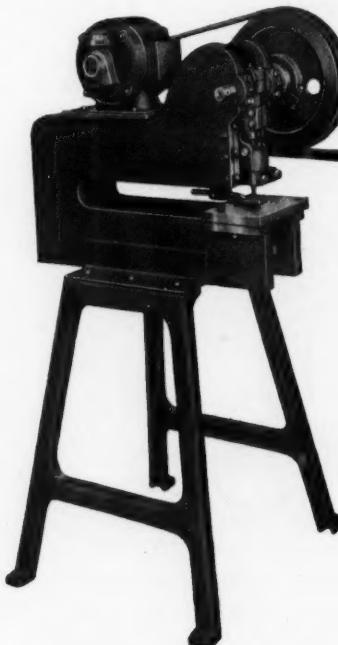


Stanley Electric Tool Div., The Stanley Works, New Britain, Conn., announces a new compact grinder, No. 153, which is balanced and designed for both hand and lathe grinding. With a motor holder the grinder can be mounted in a lathe, milling machine or shaper for external or internal grinding on dies, punches, machine parts, spiral cutters, etc.

The motor is a 3/8 hp direct drive unit mounted on ball bearings and has power to drive grinding wheels up to 1 1/2 in. The extended shaft gives a reach of 5 in. for deep internal grinding and the long spindle housing provides a grip for hand grinding. The No. 153 grinder will accommodate emery wheels, mounted points and rotary files.

61—18-B Power Press

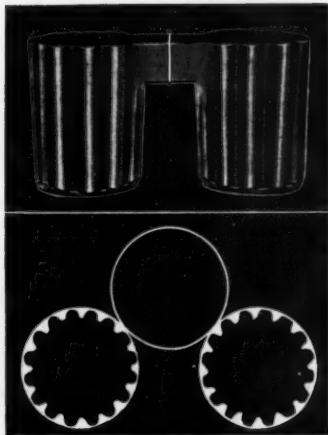
The W. A. Whitney Mfg. Co., 636 Race Street, Rockford, Illinois, announces a new deep throat power press complete with motor and starter, the No. 18-B.



This machine has an eighteen inch depth of throat and will punch 1/2 in. diameter hole through 16-gauge. It is designed for sheet punching.

46
YEARS

of RESEARCH and EXPERIENCE
... bring you this new



Top half of above illustration shows the Double Gear shaped radiator which provides greater efficiency. This shape gives a far greater heating surface with a minimum restriction to the even flow of heat, at the same time providing maximum vertical heat surface. Bottom half of illustration shows comparison of Double Gear shaped radiator with standard radiator of the same diameter. The Double Gear shaped radiator shows over three times the area for providing heat.



XXTH CENTURY ALL-CAST ZEPHAIR AIR GAS FURNACE

HERE'S a story behind that 46 years of research, too! A tale of constant striving to increase the efficiency, better the performance that has resulted in the "Action Proved" XXth Century ZEPHAIR all-cast, gas-fired air conditioning unit illustrated at left. And by "Action Proving" we mean just exactly that! This unit has been rigorously and ceaselessly put through tests that would wreck an ordinary furnace. Tests designed to show how it would react under trying conditions, economy tests to determine how cheaply the maximum of performance could be obtained, tests of strength to show whether or not it could lick any winter no matter how tough. The fact that the ZEPHAIR came through all these trials with top honors is revealed in the immediate acceptance it has enjoyed in the field.

Heating men, quick to recognize value, have noted the gear shaped double radiator which more than trebles the active heating surface of the radiator; have noticed that this means more economical operation . . . have noted the all-cast construction which assures a longer and more serviceable life on any installation, and eliminates the crackling noise peculiar to steel radiators . . . have noted the streamlined modern appearance which makes the ZEPHAIR immediately acceptable to homeowners with new or modernized basements . . . and they have also noted that XXth Century's 46 years of quality furnace building stand unconditionally behind every ZEPHAIR sold. They can see without a second glance that the XXth Century franchise will make them many an additional dollar in this and coming seasons and they are losing no time getting their names on the dotted line. You'll profit, too, by sending in today for further information of the ZEPHAIR air conditioning unit . . . we suggest you drop us a postcard at once!



XXth Century Heating and Ventilating Co.
AKRON OHIO

Association ACTIVITIES

NWAH & ACA Mid-year Meeting

Plans for the special program to be presented at the Mid-Year meeting of the National Warm Air Heating and Air Conditioning Association are well under way according to C. A. Olsen, President. He adds, the subjects and matters to be presented will make for probably the most important meeting our Association has ever held.

This popular event in the furnace industry is to be held June 3, 4 and 5, 1940, in the Palmer House, Chicago, Illinois.

Manufacturers, jobbers and heating contractors are cordially invited to attend not only the convention sessions, but also the attractive entertainment features which will include an unusual evening party, and a Golf Tournament one afternoon.

Allen W. Williams—5 East Long Street, Columbus, Ohio—as the Managing Director, has the details of this Convention in charge.

Pennsylvania

Representatives or owners of fifty sheet metal shops met with twenty-six salesmen or manufacturers' salesmen on March 31st, 1940, at the Penn Albert Hotel, Greensburg, Pa. dinner (\$1.00) at 6:15 p. m. The salesmen represented the following jobbers in Pittsburgh:

W. F. Angermeyer Co., Demmler Bros. Co., Follansbee Bros. Co., McClure Johnston Co., A. H. Johnson Co., Proie Bros. and Thompson & Co. The representatives of these jobbers were the committee in back of this meeting, along with J. D. Sprucebank, Jeanette, S. H. Meyer, New Kensington, Pa., and Frank Schimpf, Vandergrift, Pa. All the jobbers' representatives are members of the Salesmen's Auxiliary, and the others on the committee are members of the membership committee of the State Association of Sheet Metal Contractors of Pennsylvania. H. S. Criswell, Salesmen's Auxiliary secretary, acted as toastmaster.

Plato Archer, Jeannette, Pa., took charge of the community singing, after a very satisfactory dinner. E. H. Stumpf, Pittsburgh, representative of The Flintkote Co., manufacturers of asphalt roofing supplies, talked on sales and more sales. Mr. Stumpf pointed out that it is absolutely necessary for all the sheet metal contractors to put some thought into the sales end of this business, or else there soon will be no business.

J. H. Van Alsburg, representative of Hart & Cooley Mfg. Co., pointed out that careful study of all trade papers should be one of the first and last things a sheet metal contractor does, and suggested that it would be very helpful if all sheet metal contractors would tear their trade papers apart, placing the several articles in separate files under heating, roofing, repairs to gutters and conductors, ventilating, etc., to be referred to when a hard job comes up along these lines. He also suggested that it was necessary for each sheet metal man to be honest in his endeavors, giving all possible information to prospective buyers.

J. D. Sprucebank, of Sprucebank & Helzel Co., Jeannette, Pa., sheet metal contractor (taking the place of A. J. Sabathne of Altoona) explained the workings of the state association of Pennsylvania sheet metal contractors. Mr. Sprucebank asked those attending to become members of the state association, and the salesmen will try to get them lined up for the state convention to be held at Harrisburg June 13 and 14. Joe Proie spoke on air conditioning. J. E. Davis, Pittsburgh, talked on overhead and its application to sheet metal jobs.

H. S. Criswell, Secy. of Auxiliary.

M. F. Liebermann in Hospital

M. F. Liebermann of M. F. Liebermann & Son, Ambridge, Pennsylvania, secretary of The Sheet Metal Contractors' Association of Pennsylvania, has been in the Rochester General Hospital, Rochester, Pa., and is now recovering from a major operation, performed on February 24.

Boeddener Assistant to President

President C. A. Olsen, of the National Warm Air Heating and Air Conditioning Association, announces the appointment of George Boeddener of Cleveland as "Assistant to the President." Mr. Boeddener will spend most of the next few months in the field developing the merchandising and sales promotion work of the organization. His office will be at the association headquarters in Columbus, Ohio.

Mr. Boeddener has spent the greater part of his adult life in the domestic heating and air conditioning industry. His connections included the American Radiator Company of Chicago, the National Supply Company of Toledo, as manager of the heating department, and The Fox Furnace Company, which he served for four years as general sales manager at the factory in Elyria, Ohio. From the Fox Furnace Company he joined the Norge Heating Division as sales manager, and then the Globe American Corporation.

In accepting this office with the National Warm Air Heating and Air Conditioning Association Mr. Boeddener made the following statement: "With few exceptions every one of the 20,000 furnace, winter air conditioning, sheet metal and roofing dealers and contractors in the United States, many of whom are members of the national, state, county and other local associations, believe in good engineering and installation practices. It is their desire to insure enthusiastic consumer satisfaction.

"To bring about universal owner satisfaction our Association is now engaged in developing a larger publicity—merchandising and membership plan for dealers. This plan has as its objective more and better advertising and merchandising and a uniformly high standard of installations, with the quota of 5,000 dealer members for 1940, including present dealers who are members. The Association will encourage the enlargement of the national, state, county and local contractor associations in the United States and Canada and the formation of new sectional associations."



George Boeddener

Coming Conventions

1940

June 3-5—National Warm Air Heating and Air Conditioning Association. Mid-year Meeting. Palmer House, Chicago. Allen W. Williams, Managing Director, 5 East Long St., Columbus, Ohio.

June 13-14—The Sheet Metal Contractors' Association of Pennsylvania. Annual. Harrisburg. M. F. Liebermann, Secy., 1411 Merchant St., Ambridge, Pa.

(See also page 95)

Auer **AIRO-FLEX**
Directional Register
 "7000" SERIES
*the miracle
 of the year*



No. 7032

HERE IT IS—

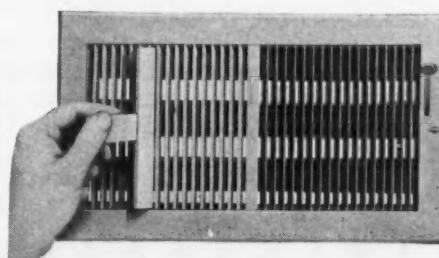
the air conditioning register that everyone is talking about! The register that gives you directional flow at the cost of an ordinary register. The new Airo-Flex "7000" Series Single Louvre Register!

The Airo-Flex is strictly in the economy class. But in appearance, lasting quality, and performance, it's far ahead of anything selling anywhere near its price. It's a simple, common sense model without unnecessary gadgets or accessories. Perfectly easy to install and adjust.

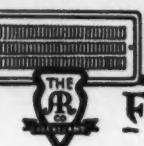
This Airo-Flex provides practical downward flow control. Grille bars are set at the factory for $22\frac{1}{2}^{\circ}$ downward deflection, but are adjustable for other angles. Airo-Flex "7000" Registers have single louvre and are also furnished in usual wall and baseboard models for intakes.

When you see this register, with its attractive lines and proportions, it's a case of love at first sight—and when you hear the price, that won't cool your affection either. We'll be glad to send new descriptive folder on it.

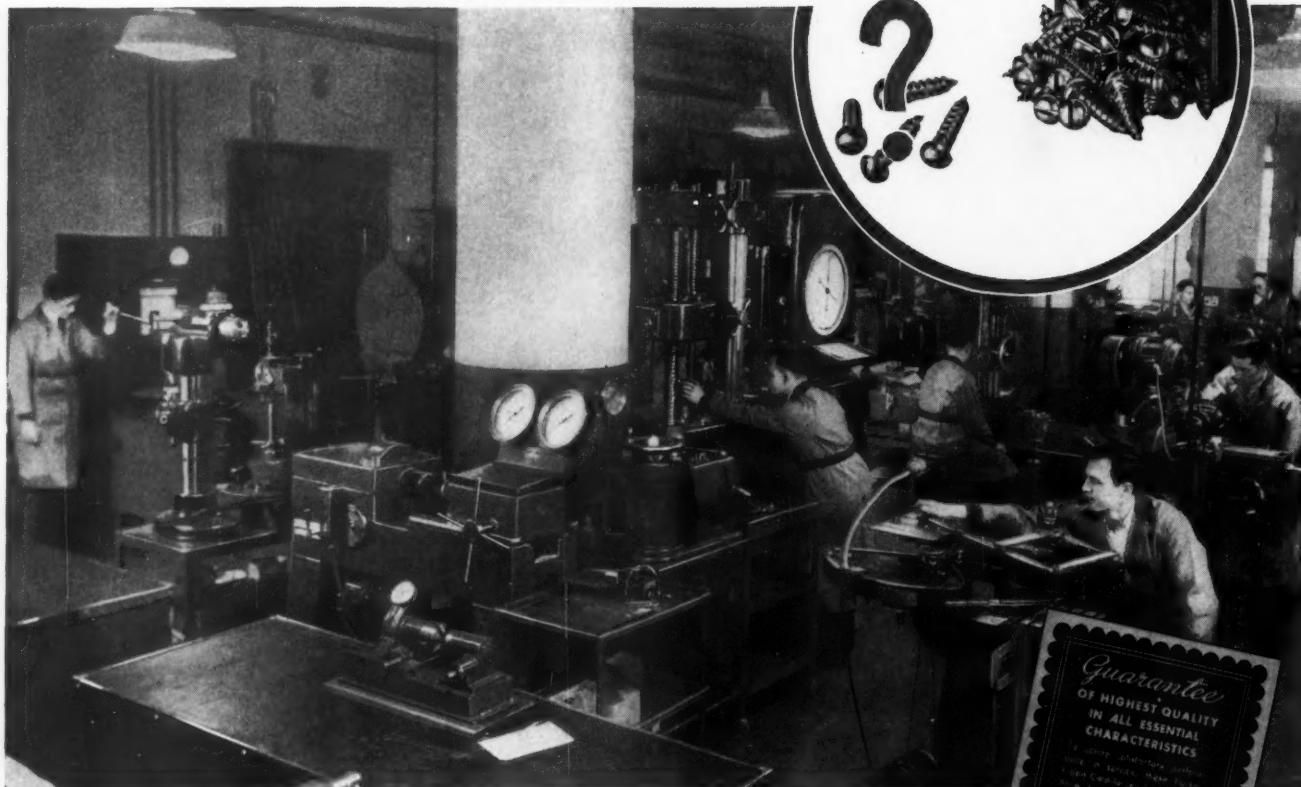
Airo-Flex is also made in the "4000" Series with vertical bar grille and multiple louvre. Method of adjustment of grille bars shown at right.



THE AUER REGISTER COMPANY, 3608 PAYNE AVENUE, CLEVELAND, OHIO

AUER DISTINCTIVE **REGISTERS**
 & GRILLES  For Air Conditioning and Gravity

NO Doubtful Few To "Gum-Up" Fastening Jobs



...When Parker-Kalon's Quality-Control Laboratory guarantees fastening devices

EVEN a few imperfect screws in a box can "gum-up" assembly work . . . waste time, boost costs, fail to make satisfactory fastenings. That's why thousands of plants specify Parker-Kalon and avoid all troubles caused by the "Doubtful Few."

Parker-Kalon Fastening Devices are made to standards that permit no "Doubtful Few" . . . standards that could only be attained when Parker-Kalon established a \$250,000

Quality-Control Laboratory. Without counterpart in the industry, this laboratory applies a unique scientific control-routine to insure that Parker-Kalon Fastening Devices always work right and hold tight.

It pays to buy Hardened Self-tapping Screws, Socket Screws and other fastening devices that are made in the most modern plant in the screw industry. Parker-Kalon Corp., 190-192 Varick St., New York.

SOLD ONLY THROUGH RECOGNIZED DISTRIBUTORS

Quality-
Controlled **PARKER-KALON**
Fastening Devices



COSTS NO MORE to get
this Parker-Kalon Quality-Control
Guarantee with every box of . . .



Hardened Self-tapping Sheet Metal Screws

Sizes and head styles for assembling light and heavy sheet metal



Hardened Screwnails

For fastening sheet metal to wood securely

Hardened Masonry Nails

For fastening to brick, mortar, concrete, etc., easier and quicker

Association Activities . . .

National Contractor Code

The Code of Regulations for the National Sheet Metal, Roofing, Heating and Air Conditioning Contractors' Association, adopted at the first annual convention in Cleveland on January 25th, this year, is now available.

Milwaukee

The monthly meeting of the Milwaukee Sheet Metal Contractors Association was held on April 1st at the Hotel Medford Club room, called to order by President Angelo Hoffmann with a registered attendance of 30 members.

The minutes of the previous meeting, held at the Milwaukee Engineering School, were read and approved. Communications received from the Building Congress of Wisconsin, Wisconsin Manufacturers' Association, Wisconsin Advisory Council, and Senator LaFollette, were read and disposed of. The electrical demonstrations at the March meeting were commented upon by the chair.

Chairman Goodwin reported that arrangements were practically completed to bring the boys of the St. Charles School to Milwaukee to give an exhibition in boxing at the May meeting—an open meeting with associate members, commencing with a dinner with the association as hosts.

Chairman Goodwin of the Auditing Committee reported that the committee has examined the books of Treasurer Marth for the year 1939, and found receipts and disbursements accounted for and that records with the books disclosed that all was correct.

The Chair explained that the Wisconsin Construction Advisory Council had called a meeting of the secretaries of the various crafts for the purpose of combating the WPA issue which will be under consideration in Congress. Consideration and discussion ensued resulting in an appeal made by the Chair for every member to contact their respective U. S. Senator and Congressman, urging them to relieve the situation by seeing that proper arrangements be made so that all building construction work will be let through competitive contract work to contractors. The Chair further stated that the secretary would issue sample letters to the members so that they might formulate their own letters in their own way, to be sent by them to their respective senators and congressmen.

Wisconsin Manufacturers' Bulletins, heretofore obtained through private subscription, are to be subscribed for by the association in the form of eight memberships for the sum of \$200. After some discussion and recommendations, it was decided that the secretary contact the organization, subscribe and apportion the memberships to members for the best interest of the association.

The death of John M. Schmidt, an old sheet metal contractor, was reported.

Chairman Walters of the Publicity Committee reported on the Billboard and Identification cards. Discussions and recommendations resulted in a motion being made, seconded and carried that we do not enter into any billboard advertisement on account of the expense involved (\$250) and other objectional features.

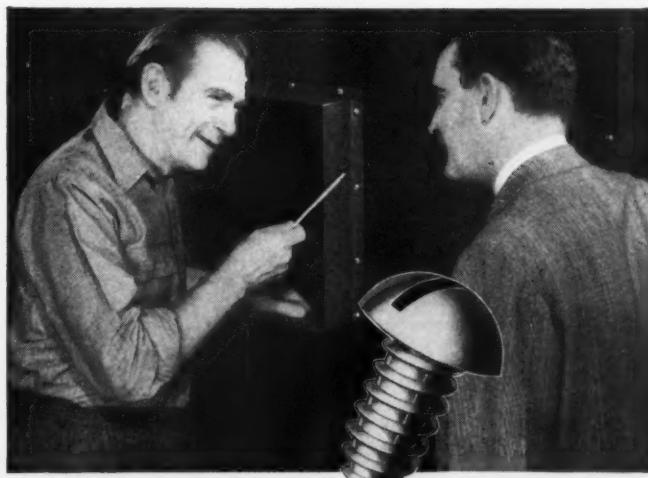
Paul L. Biersach, Secretary.

News Items . . .

Stockton Opens Modern Shop

O. J. Stockton has just opened a new modern sheet metal shop in Litchfield, Illinois, doing air conditioning, furnace and custom sheet-metal work and would be pleased to receive catalogs and other literature for his files.

"I TAKE NO CHANCES ON 'DOUBTFUL' SCREWS THAT SLOW UP THE WORK!"



So say over 40,000 sheet metal contractors
who demand Parker-Kalon Screws!

From bitter experience, contractors have learned the high price they must pay for putting up with "doubtful" screws. They have seen heads break off, threads strip, time-wasting crooked starts and screws that don't draw up tight. No wonder these men now play safe and demand Quality-Controlled Parker-Kalon Sheet Metal Screws! For these Screws can be counted on for stronger, better fastenings every time, and a better profit on every job!

Because of the rigid watch over quality maintained by the \$250,000 Parker-Kalon Laboratory, each Parker-Kalon Screw works right and holds tight. This Quality-Control helps you make more money on every job! Parker-Kalon Corporation, 190-192 Varick St., New York, N.Y.



PARKER-KALON
Sheet Metal Screws

New York Convention

(Continued on page 87)

house construction and in many cases the same results can be obtained by returning all air from the first floor with particular attention paid to the first floor hall. Prof. Miller recommended provision for outside air with suitable dampers to control the percentage of outside air passed into the system.

Slate Roofing

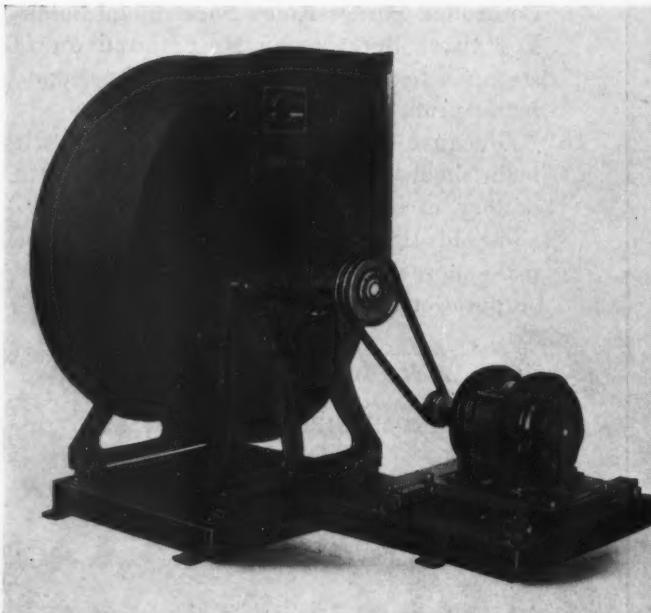
Sheet metal and roofing held an important place in the program. Dr. Paul Douglas of the Rising & Nelson Slate Company, delivered an inspirational talk on the origin of slate, how important slate has been to building progress, some of the history of slate, pointed out some of the very important characteristics which make slate a valuable roofing material. Among these characteristics are—slate never wears out, never needs painting, does not and can not burn, does not attract lightning, does not contract or expand, and can be taken off of one job and reapplied on another oftentimes at a profit in the material itself. Prof. Douglas declared that a common misunderstanding is that a slate roof demands a very much heavier roof construction, but such is not the case because slate does not absorb water and accordingly does not increase in weight whereas many other roofing materials do increase materially in weight after absorbing moisture. Any roof framing which will support 7 pounds to the sq. ft.

is satisfactory for slate roof and anything lighter than that is not good roof construction. As to the future of the slate roofing industry, Dr. Douglas declared that what is needed are better slate mechanics and slating contractors capable of designing roofs of proper construction, of consulting with architects and owners as to the proper selection of color, texture, thickness of slate, etc., in order that the owners' or architects' wishes may be met down to the smallest detail.

Cooper Roofing

Carter S. Cole of Copper and Brass Research Association, speaking on "Copper Roofing" defined the basic requirements for proper copper application as "anchor the copper substantially with the least possible amount of solder." This basic requisite should be supported by proper cleating methods using cleats large enough to take at least two nails and long enough to turn into the fold and turn over the nail heads. Only copper nails should be used, of course. What happens when a copper roof is not properly cleated or locked was demonstrated by Mr. Cole, who showed some samples of very small cleats, not more than $\frac{1}{4}$ inch wide and two and a half inches long. Failure to use copper nails permits the copper to come loose from the back-up. Mr. Cole said there were a number of places where copper applications seem to be neglected, as for example proper ridge construction where the pan sheets should be firmly locked together and a substantial ridge constructed as shown in the Copper

How QUIET Should a Fan Be?



Noise is a relative thing, but it's most objectionable in a large fan, especially when used in ventilating or air conditioning work. Because this fact was recognized by "Buffalo" Fan Engineers many years ago, Buffalo Fans are designed to render efficient service with a minimum of noise.

The Buffalo "Limit-Load" Fan with its special Silent Floating Base has demonstrated again and again its quieter operation both in practical use and by decibel rating tests.

If you want truly quiet operation in your fan installations, specify these QUIET "Limit-Load" fans.

Complete information promptly supplied on request.

BUFFALO FORGE COMPANY
497 Broadway Buffalo, N. Y.

Branch Engineering Offices in Principal Cities
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo" **Limit-Load**
REG. U. S. PAT. OFF.

FAN with Silent Floating Base



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Char-Gale Mfg. Co.

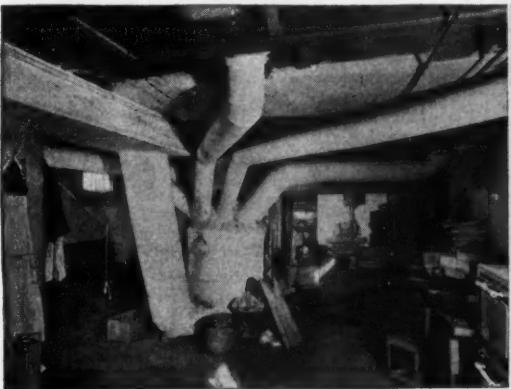
Made to Fit any Heating Plant
The Char-Gale Replacement Casing is tailor-made to fit any size or style of warm air heating plant. Strongly built, beautifully finished, easy to install.

Announcing **CHAR-GALE REPLACEMENT CASING**

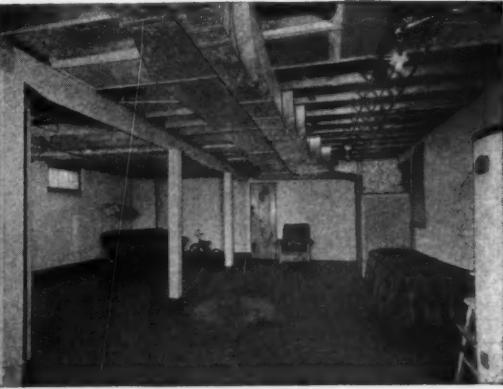
A New Source of Profits in Modernizing Basements

You know many a home owner who would like to modernize his basement, yet his heating plant has many years of service left in it and is too good to discard. A Char-Gale Replacement Casing will make his unit look as modern as the newest—at a price he'll like. It opens up a big volume of sales for you on blowers, filters, oil burners, etc., as well as casings, ducts, fittings. It increases property values and adds living

space for your customers—and gives you a big new source of extra profit!



Here is the basement of a home as it looked with the original furnace located in the center of the basement.



This is the same basement modernized with a Char-Gale Replacement Casing and Pre-Fabricated Ducts and Fittings. What a contrast!

CHAR-GALE MANUFACTURING CO.

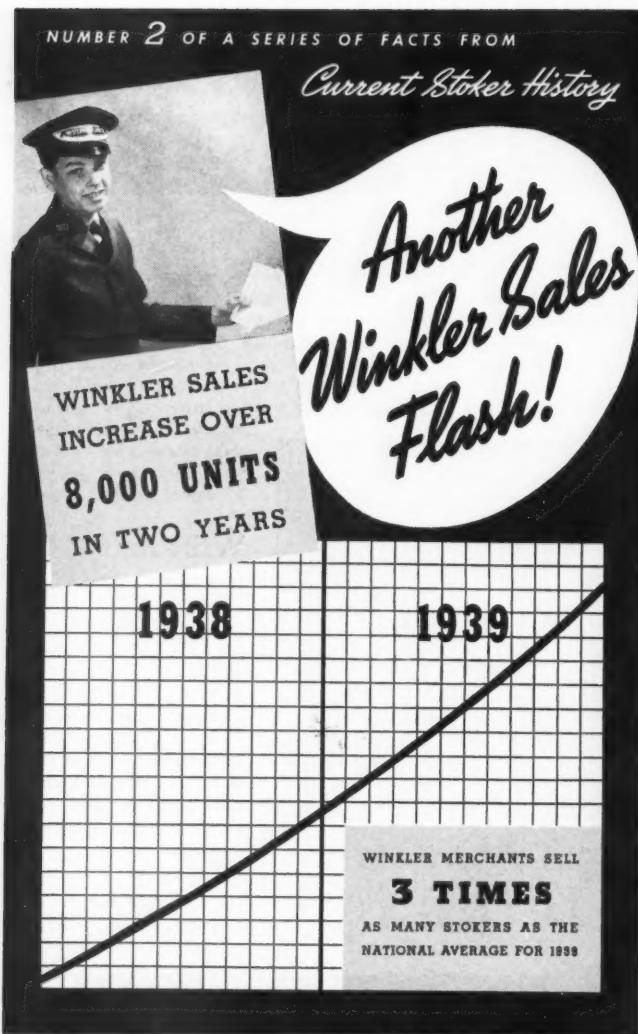
3125 HIAWATHA AVE.
MINNEAPOLIS, MINN.



Sheet metal men everywhere are turning out accurate work, quickly, at lower cost with Niagara Folders and Brakes, and other machines in the complete Niagara Line. Write for Catalog 94.

NIAGARA
MACHINE & TOOL WORKS
BUFFALO, N. Y.

Branches:
New York Cleveland Detroit



DURING the past two years, sales of the entire stoker industry have been about steady. 1938 sales were slightly under 1937. In 1939, sales were about the same as 1937.

However, Winkler sales increased over 8,000 units in that two-year period. And the sales average of Winkler merchants was three times greater than the national average of all stoker dealers for 1939.

Here are a few of the many reasons why the sales and profit average of Winkler distributors is higher:

1 A direct-from-factory franchise, coupled with U. S. Machine Corporation's mass production facilities, enable Winkler distributors to buy and sell at most favorable prices.

2 Winkler has the most complete line of stokers — binfeed and hopper models up to 800 pounds per hour, including three 30-pound per hour

models that give you a price for every domestic purse.

3 Winkler has the best and most salable line of stokers—with exclusive features that are easier to sell and mighty tough to sell against.

4 Winkler's assured sales program, with special-feature demonstrating equipment and hard-hitting merchandising assistance, gets more business. The record of Winkler distributors is proof of that.

Join up with Winkler and you'll go well out in front as the leading stoker merchant in your community. So write, wire or phone for full information today.

Selling against Winkler is like swimming upstream—change to WINKLER and swim with the current!

U. S. MACHINE CORPORATION • LEBANON, INDIANA



and Brass Research Assn. Handbook "Sheet Copper." Valleys are also critical and proper valley construction should be followed as recommended in "Sheet Copper." Considerable trouble has developed, according to the speaker, due to improper built-in gutter construction where the gutter has been soldered to the roof sheets and solidly anchored along the front edge to the parapet. Absence of suitable expansion joints across the gutter or expansion joints improperly constructed or placed at too wide apart intervals also lead to copper gutter failures. Mr. Cole demonstrated the proper application of copper at a number of these points.

Built Up Roofing

L. L. Williams, Bird & Son Co., Inc., speaking on "Built-Up Roofing" expressed the opinion that domestic air conditioning is generally sold as a system to do certain things before price is mentioned. Roofing, on the other hand, according to Mr. Williams, is sold on price first and on the type and application of the roofing secondarily. The speaker suggested a few things which the successful roofer should consider as, for instance—

1—Make a careful survey of each roof which is to be applied, whether new or replacement, to see that the roof construction is correct for the type of roof to be applied and that such critical points as gutters, valleys, drainage slope, etc., have been designed for the type of roof selected.

2—Do not sell just one type of roof, but vary the type according to the specific requirements of each individual job.

3—Propose the quality of roof in accordance with the service required or the abuse to which the roof is likely to be put.

4—If possible, determine the customer's ability to pay and sell him a roof according to his financial status, rather than to try and sell one roof (either cheap or quality) to all customers.

5—Do not let the owner or the architect specify the type of roof which he thinks is required. Too often the owner or architect does not understand the problems involved and is most likely to select a too cheap roof.

6—Do not let competitors set the price for the quality of the roof which is proposed to the customer.

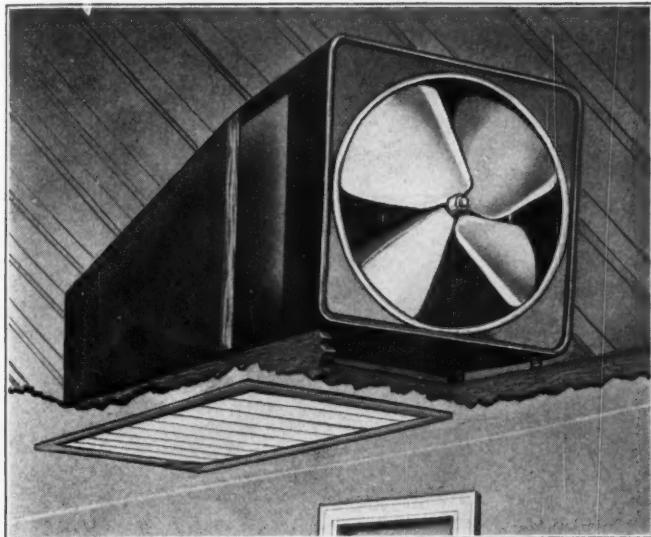
7—Build a reputation in your community so that everyone will think first of you as a quality roofer with a complete understanding of all roofing problems.

8—Be specific in your proposals and tell exactly what you propose to do.

In connection with this specific proposal, Mr. Williams read a proposal which was almost completely illiterate and another proposal which detailed specifically each item which the contractor proposed to consider and which was readily understandable even by a customer who knew nothing about roofing.

Under the auspices of the Merchandisers' Auxiliary, entertainment of boxing bouts, dancing, and an open social room were offered to contractors. The banquet held at the end of the second day featured an excellent dinner and a very good floor show.

When heating sales slump — be a COOLING MAN and earn EXTRA PROFITS!



ATTIK-PAK MODEL SHOWING AUTOMATIC CEILING SHUTTERS

From the sale of



Heating men everywhere are becoming "cooling men" during their usually dull season. They have found that home ventilating equipment is a profitable spring and summer line, because it provides their customers with effective hot weather comfort at a reasonable price.

They have found, too, that the line to push is REX-AIRATE, because:

- ...the "Attik-Pak" model, pictured above, comes complete with all-steel vent box and ceiling shutters;
- ...this model requires little time to install, leaving the seller more free for constructive sales effort;
- ...it is not necessary to cut profit margins to meet price competition, for REX-AIRATE offers features obviously worth the difference in price;
- ...there is a REX-AIRATE for every need priced from \$49.50. For full details—

WRITE TO



Division of the Cleveland Heater Co.
1937 W. 114th ST. CLEVELAND, OHIO

Kleenflo

AIR FILTER PANELS FOR
AIR CONDITIONING AND
VENTILATING SYSTEMS

LINT

IS NO PROBLEM WITH THIS FILTER PANEL

● Lint, always present in considerable quantities in the air of homes and many business establishments, usually presents a serious problem for conventional types of air filters. Unless the filter panel is properly constructed lint will soon clog it to the point where efficiency of the air conditioning unit is seriously impaired.

The scientific construction of AIR-MAZE Kleenflo air filter panels, with their unique series of screens of graduated density, is especially effective against lint. Heavier lint is caught on the face of the deeply crimped outer screen where it

can be easily brushed off because of the smooth round wires to which lint cannot hold fast. There's no clogging to obstruct free flow of air because even fine lint is no "bugaboo" for Kleenflo panels.

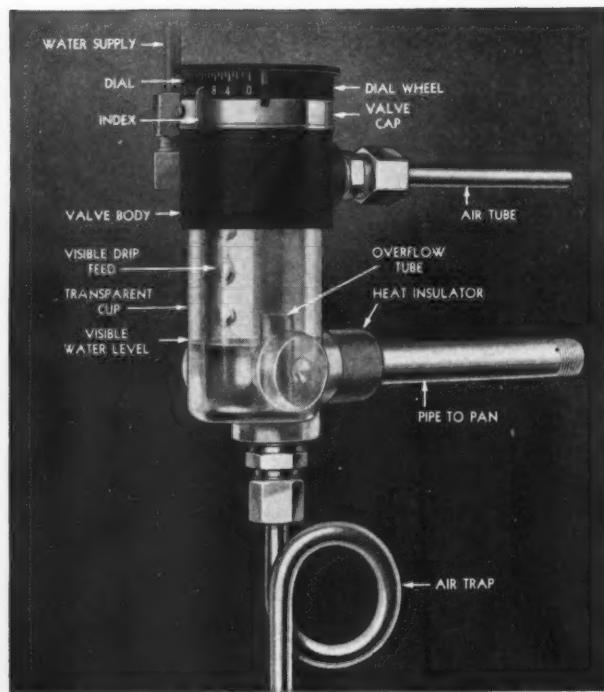
Because they are so efficient and because they need no replacement AIR-MAZE Kleenflo filter panels are economical. Easily cleaned at a cost of only a few cents. Of all-metal construction—odorless—sturdy and easy to handle as they slip readily into existing panel spaces. *Approved by the Underwriters Laboratories as fire retardant.* Write for detailed information.

**APPROVED
BY THE
UNDERWRITERS
LABORATORIES**

(UNDERWRITERS' APPROVED
SERVICING METHOD NECESSARY)

AIR-MAZE CORPORATION
5130 HARVARD AVE., CLEVELAND, OHIO

AIR-MAZE



1940 HUMIDIGRAD

Graduates Humidity to Fit the Weather

Non-Liming. New (patent pending) principle completely eliminates lime clogging.

Non-Corrodina. Latest materials of modern chemical and metallurgical science eliminate all corrosion.

Visible Operation. Owner can see water level, feed and evaporating rate.

Ideal Principle. Constant increase of humidity results in lower maintained humidity as walls, windows and weather become colder, which is ideal.

This is one of four optional Monmouth controls.

Get complete information. Every salesman, dealer, jobber, engineer and manufacturer of modern heating equipment should have all the facts. Write:

MONMOUTH PRODUCTS CO.

1933 E. 61st St.

Cleveland, Ohio

MONMOUTH
The Greatest Name in Humidification

Michigan's Convention

(Continued from page 81)

ical heating code in Toledo, indicates that every heating ordinance should be so written that none of the regulations are open to question, that the regulations are plain and easily understood, and that the code is comprehensive enough to include every possible contingency or question. Toledo's experience has been that the code should not attempt to itemize all regulations, but, if possible, should regulate by means of citing existing and accepted industry codes. Thus, the gravity code or the practical code or the technical code could be cited as the basis for design and installation

OFFICERS FOR 1940.

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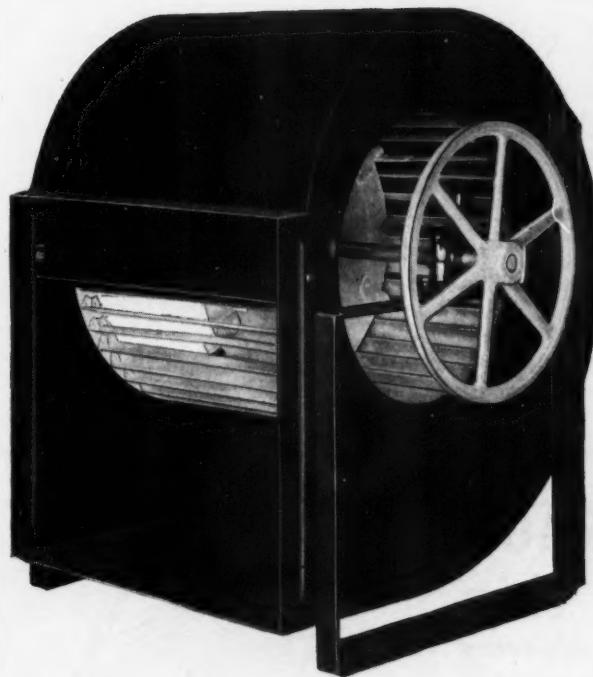
Secretary-Treasurer—John F. Behler, Behler-Young Co., Grand Rapids.

Sergeant-at-Arms—Harry Oberbeck.

without incorporating into the local ordinance each of the separate provisions included in the industry codes. (Ed. note: This is not legal in some cities.) In Toledo, said Mr. Bitter, at least 75 per cent of all warm installations are now mechanical systems which demand a higher degree of knowledge than former types of work. In Toledo every heating man is compelled to pass an examination, no matter how long he has been in business and in order to enforce the code good inspection is demanded. Toledo has attempted to prevent undesirable inspection by making the inspector pass the same examination as the heating contractor.

As a result of code enforcement in Toledo, the general trend has been to better warm air heating installations. Contractors have been compelled to educate themselves in the design and installation of adequate systems. Installations generally follow more standardized design than heretofore, and installation generally is more in accordance with accepted practices. Good inspection has been insisted upon in Toledo, as a result of which contrac-

BLOWERS!
BLOWERS!
BLOWERS!



SOUTH BREEZE BLOWERS

Stronger Construction and rust proofed for longer years of service.

No Vibration. Every rotating part balanced and adjusted by Electrocon Dynamic Balancer.

Sixteen Years of knowing how. Write for catalog giving dimensional and performance data.

Complete Line of blowers, parts, ventilating and evaporative cooling equipment.
Compare our prices.

SOUTHERN FAN & BLOWER CO.

1311 So. Lamar Street, Dallas, Texas

AN EVAPORATIVE COOLER

That WINS Friends
And KEEPS Them
Through the Years



Great National's GOLDEN EAGLE
The Evaporative Cooler That's
Backed by 16 Years' Experience

- Installed in business places it DOUBLES summer business.
- Low cost — economical to operate — RUST-PROOFED and built for years of trouble-free service.
- Endorsed by hundreds of users.
- A big-profit REPEATER line, in all sizes for homes, stores, buildings.

Mail the coupon today.

**GREAT NATIONAL
AIR CONDITIONING CORP.**
Dallas, Texas

Great National Air Conditioning Corp.
1307 So. Lamar St., Dallas, Tex.

Send particulars to

Name

Address

City-State



Henry Delnay and Herman Pueffer make some "fun" for the photographer.

tors are able to design and sell a better type of installation.

Contractor and Mechanics Training

A. T. Bersey, Industrial Training Institute, Chicago, speaking on the need for training mechanics and contractors, pointed out that new equipment and new methods have been coming forward rapidly making it increasingly difficult for the con-

tractor or mechanic to keep abreast of all new developments and trends. In an effort to provide contractors and mechanics with a quick means of obtaining the latest information on equipment and proper installation or design procedure, Industrial Training Institute is now offering short courses in which, within a period of approximately 40 hours, one particular phase of air conditioning can be learned thoroughly. This includes actually working with the apparatus used, designing and installing the system, trouble shooting the equipment and, in general, making the system perform to the owner's satisfaction. Under the new arrangement, it is possible for a contractor to take a quick course in oil heating or stoker equipment, or cooling without regard to other co-related information which can be obtained also in short courses.

Wages and Hours Act

Harry A. Reifin, U. S. Dept. of Labor, Wages and Hours Div., pointed out some of the methods used to expedite the handling of wages and hours problems. Today, the speaker declared, at least 75 per cent of all industries affected by the wages and hours law are within comfortable automobile drive of a regional or branch office. As a result of reorganization, the regional director today is empowered to close cases of violations of the Act without court action where the total of the amount of wage restitution does not exceed \$50,000.

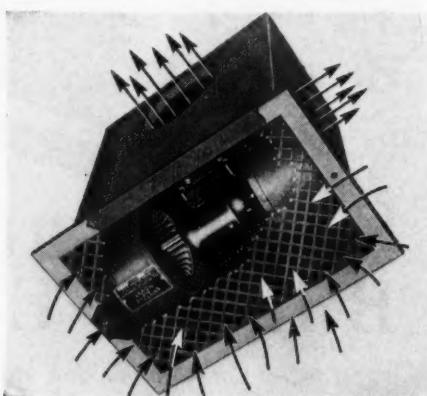
Mr. Reifin appealed to the contractors to evaluate the fair labor standards act on the basis of its

YOU don't have to sell SPACE HEATERS to CASH IN on this \$25,000,000 market - - - because every home using a space heater is a prospect if you sell the Skuttle Air Mover

Whether it's a wood, coal, gas or oil space heater used in the home, the SKUTTLE AIR MOVER will increase its heating efficiency. This blower unit will circulate heat in 2 to 3 extra rooms, as desired. It comes completely assembled with rubber mounted blower motor switch and register. It is simple to install, any home owner can do the work himself.

Order a SKUTTLE AIR MOVER today if you want to cash in on this tremendous space heater accessory market.

Skuttle
AIR MOVER



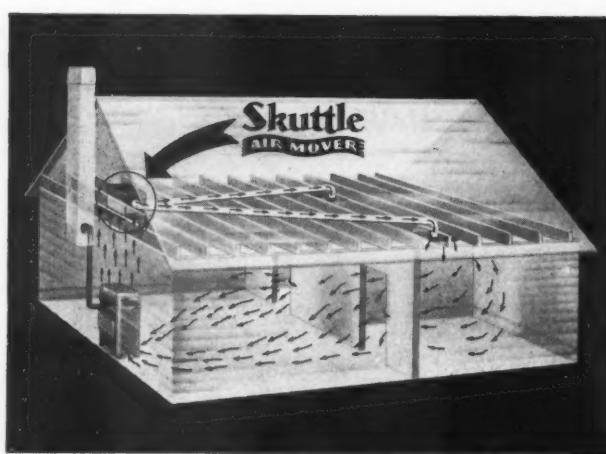
The cut-away illustration above shows how the heated air is drawn through the register of the SKUTTLE AIR MOVER and pushed out the duct openings.

IT Circulates HEAT IN THE WINTER and Cool AIR in the SUMMER

An added advantage of the SKUTTLE AIR MOVER is that it can be used to cool off the house in the summer by merely removing the top of the unit so that the hot air can be drawn out of the room and blown through an attic window.

The illustration at left shows how the unit is placed between the joists in the attic, directly above the heater with insulated ducts leading to the rooms to be heated. The blower draws up the heated air through the register and pushes it out through the duct openings, thus circulating the heat evenly in each room.

The SKUTTLE AIR MOVER is a fast-selling accessory for space heaters, that can increase your profits both in the winter and summer months. Their low prices should interest you, so why not write for complete details and prices today?



J. L. SKUTTLE CO.
AIR CONDITIONING EQUIPMENT

1015 FRANKLIN ST.

DETROIT, MICH.

Now in 3, 5, 7½, 10 and 15 Ton Capacities

CURTIS Packaged Air Conditioners

With a wide range of from 3 to 15 tons capacity, Curtis Packaged Air Conditioners now meet the demands of a variety of markets with complete mechanically refrigerated air conditioning at low cost.

Every type of retail establishment is now a prospect for this Curtis equipment, for they can profit from the advantages of air conditioning without costly installation charges or disturbance to fixtures.

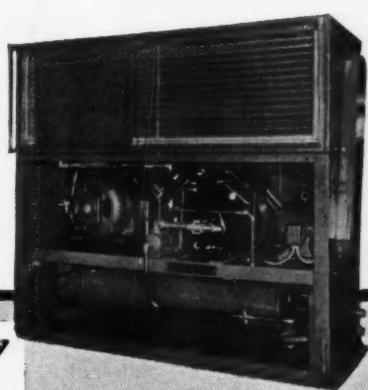
The Curtis Store and Office Cooler and the Curtis Remote or Central Type Air Conditioner are completely factory designed and built packaged units that cool, dehumidify, circulate and filter the air. They are quickly and easily installed, readily financed, and are adaptable for heating if desired.

The demand for Curtis Packaged Air Conditioning is growing every day. Write to Curtis for complete information on the Curtis line.

Curtis Refrigerating Machine Company



Division of
Curtis Manufacturing Co.
1946 Kienlen Ave. St. Louis, Mo.
Established 1884



7½, 10, 15-ton Remote or Central Type Air Conditioner

Meet ALL Requirements



3 and 5-ton Packaged Type Air Conditioner

Why Dealer Membership in the **NATIONAL WARM AIR HEATING and AIR CONDITIONING ASSOCIATION?**

You tell your prospects why you install according to the Codes and the "Yardstick for the Evaluation of a Forced Warm Air Heating System." You show them your Membership Card. You tell them about the \$200,000 expended on Engineering and Research conducted in cooperation with the University of Illinois, in the \$25,000.00 Research Residence in Urbana. You give them facts and information which is contained in our "Leadership Program"; a booklet which is mailed to all new members.

By building your sales story around the Association, you are in effect building yourself and reducing sales resistance. It makes YOU stand out in front. It makes YOU stronger. It fortifies YOU in meeting all kinds of competition in any section of the United States. You bring the 26 year outstanding record of achievement of the Association to your prospect. YOU tie in your sales efforts not only with the Research Program but with its far flung PUBLICITY PROGRAM.

YOU display the Association's TRIANGLE EMBLEM in your store and display room, office, show windows, on trucks, letterheads and advertising material of all kinds. Display of the EMBLEM ties in with the NATIONAL PUBLICITY PROGRAM including releases to 1200 newspapers and 122 Radio stations monthly. In this way YOU tell prospects about *OUR KIND of HEATING* and *WHERE TO BUY IT*.

You will receive monthly bulletins and sales and merchandising plans as developed. When your application is received we will send you membership card, window and store association emblem signs, three copies of the Codes, Leadership Program, membership certificate and emblem electrotypes.

The National Warm Air Heating & Air Conditioning Assn.
A. W. Williams, Managing Director, Columbus, Ohio.

Please enter our application for Associate Dealer membership in the Association. Check for annual dues of \$10.00 is attached.

Name..... Street Address.....

City..... State..... Date.....

SEND IN YOUR APPLICATION TODAY!

application to an individual business. He pointed out that any given industry, to obtain relief from depression periods, must recognize that profits lie in the hands of those who purchase the industry's service or commodity. Payment of time and one-half for overtime is not designed to be a punitive measure, but is intended to effectively spread employment. Spreading employment places purchasing power in the hands of a greater number of people. According to government statistics, only three per cent of our families have incomes as much as \$5,000 and less than one-seventh of all American families have incomes of \$2,500 a year. If business is to be improved the little incomes (those of less than \$1,250) must be increased and stabilized, for half of the market for any industries' services or products are found in the 16,000,000 families in this lowest income bracket. It is these low income families who benefit most directly by work spreading, wage increase, etc.

The speaker explained that at the present time and until October 24, 1945, the minimum wage will be 30 cents per hour, increasing to 40 cents after 1945; that time and one-half must be paid for all hours work in excess of 42 hours per week, until October 24, 1940, when the maximum work hours per week will be 40 hours, after which overtime must be paid. The speaker gave considerable attention to the so-called "outside salesman" who is exempt from both wage and hour provisions providing that he customarily and regularly performs his work away from the employer's place of business; is customarily and regularly engaged in mak-

ing sales; and does no substantial amount of work of the same nature as that performed by non-exempt employees. The speaker pointed out that labor agreements which are not in conformity with the provisions of the act must be voided in favor of the provisions of the act. Or, where the collective agreement is at wages substantially above or now is substantially below the provisions of the act, the wages and hours act does not affect the collective agreement.

According to the speaker, the department has ruled that employees engaged in the original construction of buildings are not generally within the scope of the act even if the building when completed will be used to produce goods for commerce. But employees engaged in the maintaining, repairing or reconstructing of roofs or buildings which are being used in the production or storage of goods in commerce are entitled to the benefits of the act and should be regarded as such no matter who employs these individuals.

Economy in Government

E. T. Conlon, manager of the Chamber of Commerce of Michigan, speaking on economy in government, with particular reference to government in Michigan, said that payroll figures recently published indicate that the payroll for 1933 was approximately 14½ millions, whereas in 1939 the figure was above 25½ millions. The increase has occurred during various administrations, while party leaders of all administrations loudly claimed economies in government. The payroll figure, declared the speak-



ECONOMY TYPE Quality at a Price!
Furnished with both wing and hex lock nuts.
Made only with $\frac{1}{4}$ " Bearings... No. 40 1/4—List Price 30c Set
May also be had with snap end bearing.
No. 40 1/4S—List Price 32c Set

H&C DAMPER REGULATOR SETS

Pick the Type that Suits you Best!

H&C offers four different sets, three of which, in the $\frac{1}{4}$ " size, are furnished with snap end bearing to permit the installation of even the smallest dampers without bending. All are quality sets in every detail with all parts rust-proofed; all are equally adaptable to splitter or regular dampers. See your Jobber or write for sample and descriptive literature.

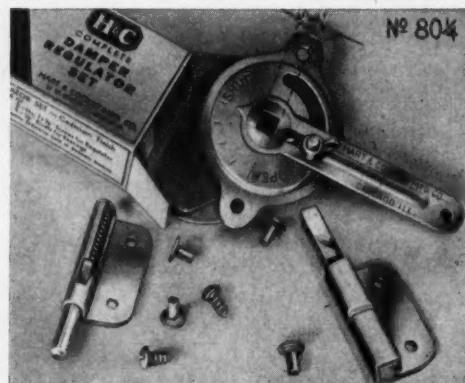
HART & COOLEY MANUFACTURING CO.
HOLLAND, MICHIGAN -- Chicago Office at 61 W. Kinzie Street

BRACKET TYPE (left)

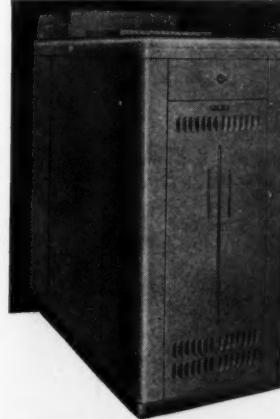
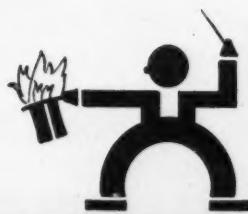
With $\frac{1}{4}$ " Bearings—No. 50 1/4
—List Price 40c Set
With $\frac{3}{8}$ " Bearings—No. 50 3/8
—List Price 60c Set
 $\frac{1}{4}$ " size has snap end bearing.

DISK TYPE (right)

With $\frac{1}{4}$ " Bearings—No. 80 1/4
—List Price 40c Set
With $\frac{3}{8}$ " Bearings—No. 80 3/8
—List Price 60c Set
 $\frac{1}{4}$ " size has snap end bearing.



**SAVES TIME
SAVES EFFORT
CUTS COSTS**



PACKAGE UNIT

AIR CONDITIONING FURNACE

BUILT FOR THE
Low Cost Home

WALL-FLAME OIL BURNER BUILT
IN AT FACTORY... NO INSTAL-
LATION EXPERIENCE NECESSARY



Now anyone can install the true "package unit" air conditioner because it has been amazingly perfected by Toridheet engineers. Toridheet units now have the wall-flame oil burner BUILT INTO THE FURNACE SHELL at the factory. Installation of the unit is completed by simple steps which anyone can understand. No previous oil burner knowledge is required.

The Series OMS air conditioning furnace has been proved in countless installations under all sorts of conditions... it has been installed by all types of workmen. It is regarded by dealers, service men and users as "the world's finest oil heating unit."

The Series OMS unit is made in two models with maximum capacities of 75,000 B.T.U. and 100,000 B.T.U. It has a number of incomparable features... the pre-heater radiator which accelerates heating... elevated combustion shell to assure free circulation of air... many others.

Toridheet Series OMS units are priced to sell small-home owners quicker at greater profit. Let us tell you why. Write at once for complete information on the Series OMS unit... ask us for details on the complete Toridheet line.

CLEVELAND STEEL PRODUCTS CORP.

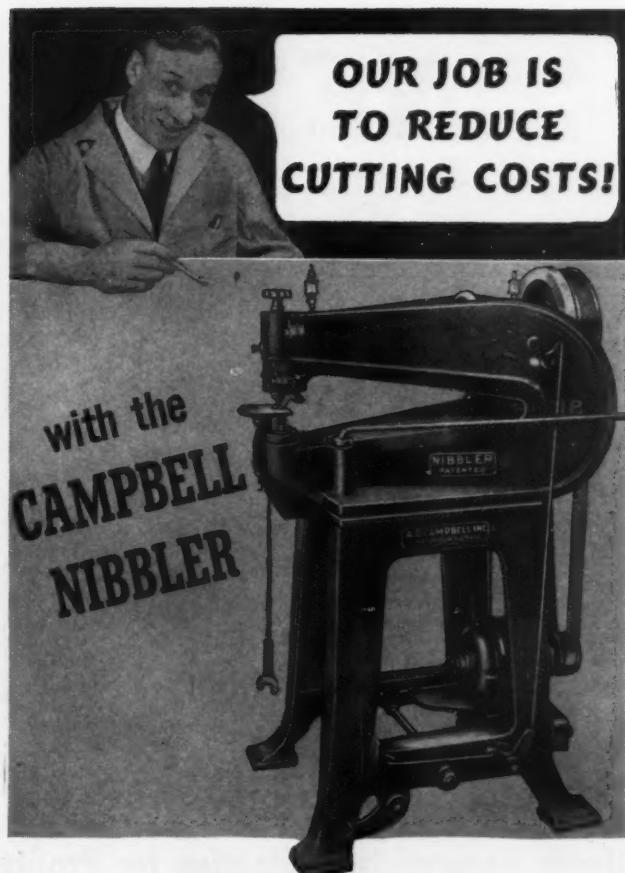
TORIDHEET DIVISION

Madison at W. 74th Street, Cleveland, Ohio



TORIDHEET

OIL BURNERS • AIR CONDITIONING UNITS
OIL-BURNER BOILERS • WATER HEATERS
FURNACES FOR OIL, GAS AND COAL



with the
CAMPBELL
NIBBLER

● We have reduced costs in thousands of instances in which irregular shapes had to be cut from steel and other commercial materials. In some cases costs were reduced as much as 80%.

No burrs are left by the Campbell Nibbler. This means that little or no finishing is needed. The machine causes no internal strains or invisible fractures. It does not distort or case-harden materials.

Campbell Nibblers often eliminate the cost of dies on short runs.

BUY ACCO QUALITY in Campbell Cutting Machines; Wright Hoists, Cranes and Trolleys; Page Welding Electrodes; Page Wire Fence; American Chains; Tru-Lay Preformed Wire Rope; Reading-Pratt & Cady Valves.

ANDREW C. CAMPBELL DIVISION
DESIGNERS AND BUILDERS OF SPECIAL MACHINERY
BRIDGEPORT, CONNECTICUT

In Business for Your Safety

**AMERICAN CHAIN & CABLE
COMPANY, Inc.**

NEW 200 Amp. LINCOLN



Here's Greater Specialization for Profits

• "Shield-Arc Jr."—the low-cost D.C. welder—is now available in 200 amp. size. Rated 40 to 250 amps. *direct current*, it has an exceptionally wide range of application including the welding of all common metals and alloys. It provides ample power for the speedy welding of heavy shapes and plate as well as light-gauge materials for a greater range of profitable specialization in fabrication work.

"Job Selector" and Current Control—both continuous and self-indicating—give you ideal TYPE of arc and correct arc INTENSITY for every job. No compromise settings. No guesswork. You get proper setting for highest weld quality and highest welding speed on every job.

CASH IN ON ARC WELDING WITH THIS NEW LINCOLN WELDER

Arc weld galvanized ductwork, etc.
Build framework for signs, etc.
Build machine guards, bases, etc.
Fabricate tanks and containers.
Fabricate special shop structures.
Weld bronze, aluminum, stainless, etc.
Repair broken cast iron parts.
Build up and hard-face worn parts.
Increase your income \$100 to \$500 monthly

"Shield-Arc Jr." Welders are available for Sheet Metal Shops as follows:

Rating	Range of Application	Price*
75 amp.	Light-gauge to medium	\$158
100 amp.	Light-gauge to medium	168
150 amp.	Light-gauge to heavy	198
200 amp.	Light-gauge to heavy	243

* Price for portable model, f. o. b. Cleveland, freight prepaid

Consult the nearest Lincoln office or mail the coupon for details today.

THE LINCOLN ELECTRIC COMPANY, Dept. EE-12, Cleveland, Ohio

Send free bulletin on 200-Amp. Electric Driven "Shield-Arc Jr."

Name _____ Position _____

Company _____

Address _____

City _____ State _____

er, offers conclusive proof that economies will never be effected until the taxpayers bring united efforts to bear. The constant demand of Michigan public officials is "give us more money to spend." Where an office holder tries to reduce the cost of running his job, his savings are usually lost to the taxpayer through the extravagance of some other department.

As to methods of reducing state expenditures, Mr. Conlon declared that the State Chamber of Commerce has established affiliated units in each of the 83 counties of the state and these are rapidly being built into effective bodies of taxpayers who will bring pressure to bear on the legislature and public officials to halt excessive spending. Radio pamphlets, news reel and the general support of newspapers throughout Michigan are being utilized to make the public acquainted with the serious condition of Michigan's finances. The speaker pointed out that this condition is not limited to Michigan alone, but is a common problem of every state in the country.

Factors Effecting Stoker Satisfaction

(Continued from page 76)

cient traps, and a gravity warm air system may be so poorly designed that the air circulation cannot be increased enough to supply the heat in less than continuous operation without increasing the bonnet air temperature beyond safety and comfort limits.

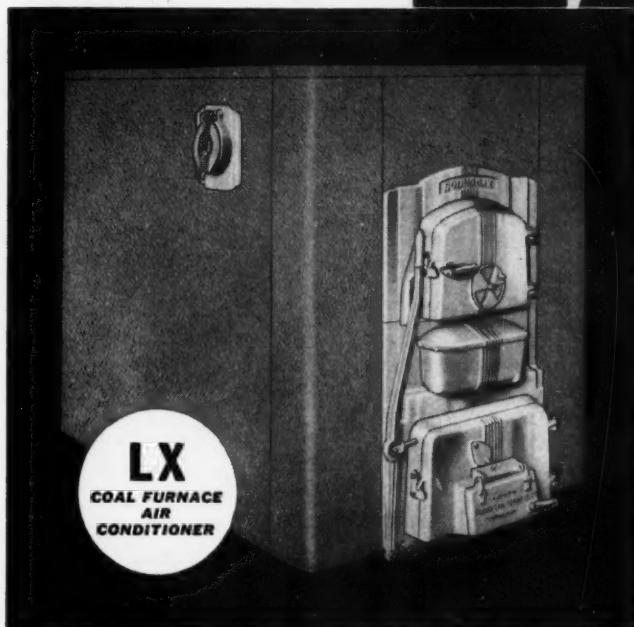
It is therefore necessary that the dealer have enough experience with heating installations to be able to determine whether a stoker will perform satisfactorily in regard to comfort, safety, and economy, besides knowing how to install it properly. Complete satisfaction to the owner can come only through a combination of good mechanical features of the stoker, proper selection as to size, good installation, and a heating system that is suited for automatic firing.

We feel that another word of warning is not amiss regarding the installation of any kind of automatic heating, namely: that if some rooms are much more exposed to the weather or to unheated spaces than the average, living conditions in these rooms may not be so good after the automatic heating device has been installed as before. This is due to the fact that these rooms will cool off at a much faster rate than the other rooms, and with an intermittent heat supply it is impossible to avoid greater temperature variations in them. Increasing the amount of heat to these rooms will not change this condition, but will simply increase the average temperature during a cycle. The only remedy consists in placing the thermostat in the room having the greatest heat loss in relation to its cubic contents even if it does not happen to be the coldest. It may then be necessary to re-balance the heating system after automatic firing is installed.

[The End]

If you're looking for
more business
INVESTIGATE THESE...

**TWO NEW
MONEY MAKERS**



Looking for more business? Then stop right here, for Round Oak offers two new money makers that are certain to hit new sales peaks. The LX is a remarkable new furnace that offers home owners of modest means all the practical advantages of low cost coal heat, plus the comforts of winter air conditioning...a compact, coal fired unit with all the necessary circulating, filtering and humidifying equipment; built especially for economical modern heating. And the new Round Oak Stoker is a real winner, too. It's simple, yet remarkably efficient, safe and dependable. It's easy to install, easy to operate and *easy to sell!* Learn all about these money makers today. **THE ROUND OAK CO., DOWAGIAC, MICHIGAN.**

Write, Wire or Phone For Facts

ROUND OUT
WITH
ROUND OAK
of Dowagiac, Mich.

THE COMPLETE LINE OF FURNACES
OIL BURNERS AND STOKERS



**Give Your
Customers
Better
Ventilating Jobs—
Install the**

**Swartwout
AIRJECTOR**

Name Registered U.S. Patent Office

You build a reputation for outstanding ventilator jobs when you sell your customers Swartwout Airjectors. You save time, yet do the acceptable work that brings you more business and profits.

The Airjector is a highly efficient power ventilator built on the rotary principle. Curved body lowers air travel friction; vane holds ventilator in the wind's direction, utilizing the added suction effect; propeller type fan has large air moving capacity at low power cost; extra large capacity outlet assists gravity circulation and suction "pull."

Other Swartwout Ventilators that equip you to handle any requirement are the Swartwout-Dexter Heat Valve and the Swartwout Rotary Ventilator. Write today for complete data, prices and discounts.

THE SWARTWOUT COMPANY
18615 Euclid Ave. Cleveland, Ohio

Swartwout
VENTILATION SPECIALISTS



AIROTOR
Blower Wheels

Light, sturdy and inexpensive is Torrington's new patented AIROTOR Blower Wheel. End rings are punched and formed in single pieces which are flanged to carry blades. Blades are punched and formed in a single strip. Hubs are rigidly mounted by peening which eliminates heavy flanges and rivets. *No rivets are used in the AIROTOR Blower Wheel.* Simple construction and sound engineering design insure a wheel producing maximum air delivery with a minimum of noise. Steel with aluminum lacquer finish is standard. Present sizes: 3 $\frac{5}{8}$ ", 12" and 16" diameters. Similar wheels will soon be available in a complete range of sizes from 3 $\frac{5}{8}$ " to 20" in both single and double widths.

Bulletin includes performance ratings and housing scroll designs. Write for information on the complete Torrington line of Blower Wheels and Fan Blades.



The Torrington Mfg. Co.
Torrington Conn. U.S.A.

Heat Loss Calculations Without Mathematics

(Continued from page 60)

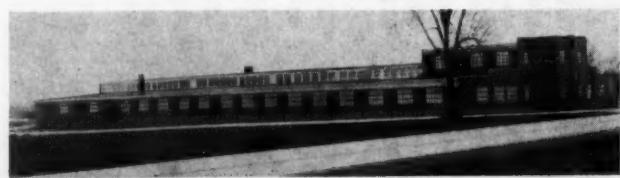
a construction of ceiling, wall, or floor requires needless tables. Also, a full description is given in the GUIDE.

Walls of different construction in same room can be easily taken care of as indicated on Construction Information sheet. In most cases each item on this sheet will cover the entire floor.

I do not claim this to be a short cut method for finding Btu losses, but an accurate one within its range, needing a minimum of head work. Also, the sheets can be picked up again in 6 months or longer without having to study up just how you obtained certain results.

CONSTRUCTION INFORMATION

		Coeff.
Attic	Room 101.	Space above fully heated
Ceiling	Room 101.	W. & N. wall see Guide 1938 Table 5
		Wall No. 65 B..... .26
Wall		E. Wall adjacent garage heated to 50° Table 3. Wall No. 26C ..... .17
Floor	Room 101.	Table 8. No. 6D
		No heat under. Ground Tem. 25°... .14
	Room 101.	D. E. Sash S. T. Glass. Table 13
Glass and		3-W-2-8x4-6
Doors		2-W with S. S..... .45
		1-W Plain..... 1.13
		Outside doors none
	Room 101.	Leakage 15 m. wind
		Table 2. Fig. 4-5
Infiltration		Storm Windows (suspended) ..... .68
		Plain ..... .71
		Cfm \times .018 = Coeff.
		Cu. ft. Dry air warmed 1° per Btu @ 115° Tem. = 60 abt.
		60
		<hr/> $(115^\circ - 65^\circ) \times 60 = .020$

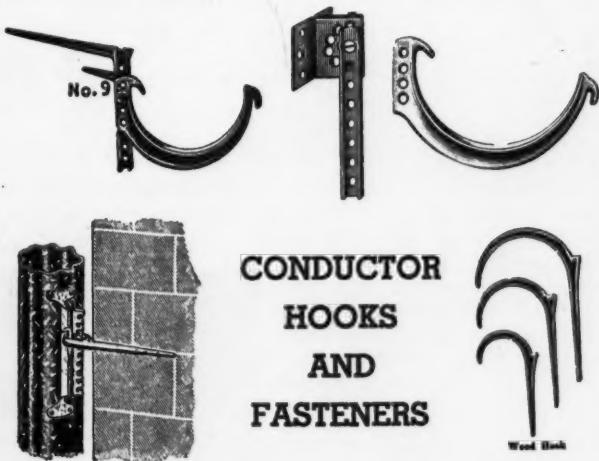


Aldrich Company Moves

The Aldrich Company has moved to their new plant and office in Wyoming, Illinois, about 35 miles north of Peoria. This is a new modern building, equipped with the latest machinery and all air conditioned.

-BB-

SHANKS and CIRCLES



The only really complete line of hooks and hangers. Send for complete descriptive literature.

Sold Through Leading Jobbers Everywhere

BERGER BROTHERS CO.
229-237 ARCH ST. PHILADELPHIA

THERMO-DRIP *Automatic HUMIDIFIER*

• Equip any warm air furnace with a THERMO-DRIP Humidifier . . . your 'phone bell won't jangle with service calls. The feed valve design of this advanced air moistener is cradled in an open yoke (the drip feed operating principle makes it unnecessary to enclose it). That spells freedom from liming, sticking and flooded pans because the valve stays cool always! Remember this feature when you buy. Choose a humidifier with a water feed valve that is isolated from heat. Choose a THERMO-DRIP . . . and dodge servicing. Sold by leading furnace supply wholesalers.

AUTOMATIC HUMIDIFIER CO.
18th & Main Sts., Cedar Falls, Iowa



• Even in extremely hard water service, Monel metal construction of the Thermo-Drip Valve banishes corrosion and insures continuous, dependable service.

QUALITY EQUIPMENT-- FROM HESS-- COSTS LESS



INCREASED SALES and PROFITS

Are assured if you sell Hess equipment. Why sell ordinary furnaces as sold by mail order concerns and other competitors when Hess offers superior value and performance at low prices.

THE HESS LINE IS COMPLETE

It's Different and Better.

The Hess furnace is rectangular throughout with heavy welded steel innerbody. Hess blower-filter units, oil burners, stokers and accessories, fill every dealer requirement. Exclusive territory protection. Free plan service. FHA terms. Free consumer literature gives every advantage to a Hess dealer.

WRITE FOR DEALER PORTFOLIO

HESS WARMING & VENTILATING CO.
1211-27 S. WESTERN AVE. Founded 1873
CHICAGO, ILLINOIS

FLUSH TYPE VENTURI-FLO



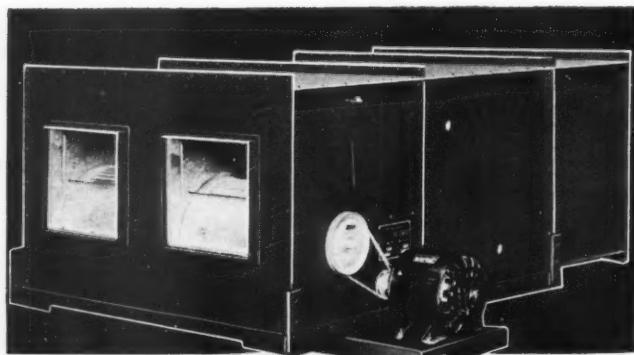
venturi-flo

CEILING OUTLETS

Developed by the makers of the famous UNI-FLO Grilles and Registers . . . to give greater aspiration, more uniform air distribution, better appearance. Available in Flush Type (shown above) or Surface Type. Please write for further information.

Office Building of S. C. Johnson and Son, Inc., Racine, Wis. Architect: Frank Lloyd Wright. Venturi-Flo Engineered and installed by: Westerlin and Campbell Co., Chicago.

BARBER-COLMAN COMPANY
ROCKFORD • ILLINOIS



CLARAGE Multitherm Units

- ✓ Cooling
- ✓ Heating
- ✓ Complete Conditioning

Finest type of equipment available for small summer cooling, winter heating or complete year-round air-conditioning jobs. Widely used in factories, offices, stores, etc. Highly efficient; remarkably compact; easily installed in any idle space.

Write for Bulletin 107 describing various arrangements and giving capacity ratings.



CLARAGE FAN COMPANY
872 PORTER STREET • KALAMAZOO, MICH.
Sales Engineering Offices in all Principal Cities

Become the
LEADING MERCHANT
IN YOUR TERRITORY WITH
Gar Wood
HOME COMFORT-PROVIDING EQUIPMENT

SUSTAINED LEADERSHIP

Gar Wood automatic home heating and air conditioning furnace-burner units led the nation in percentage of total sales in 42 key markets for the last four consecutive years—according to statistics published by a national trade authority. Cash in on Gar Wood's sales popularity. Become a prosperous leader in your community. Write or wire for the Gar Wood franchise facts.



PRODUCTS

Oil- or gas-fired automatic Tempered-Aire Winter Air Conditioning and Heating Units—Split Systems—Boiler-Burner Units—Conversion Oil Burners for existing Boilers or Furnaces—Domestic and Commercial Water Heaters—Ventilators—Airdux System for air distribution and control. Ask or write for descriptive literature.

Sell RATIONALLY ACCEPTED PRODUCTS

GAR WOOD INDUSTRIES, Inc.
AIR CONDITIONING DIVISION • DETROIT, MICHIGAN
CANADIAN DISTRIBUTOR: ENGINEERING INDUSTRIES, LTD. TORONTO, ONT.

With the Manufacturers . . .

Brauer in New Home

A. G. Brauer Supply Co., after 56 years at Third and Locust Streets, St. Louis, has moved to their new home at 2100 Washington Avenue, with free parking space for customers. The company has in stock furnace, boiler and stove repair parts, gas, gasoline and oil stove parts, furnace fittings and supplies, air conditioning equipment and filters.

Louis Kuehn of Milcor Retires

Louis Kuehn, founder of the Milcor Steel Company, Milwaukee, announced his retirement as Chairman of the Board on March 4. In the span of thirty-eight years, Mr. Kuehn has seen his company grow from a very modest beginning—the Milwaukee Corrugating Company—to an organization recognized as one of the foremost manufacturers of building products in the United States.

The first catalog was a 208-page book, which showed a remarkably complete line in the sheet metal field—eaves trough and accessories, conductor pipe, ventilators, architectural ornaments, roofing and siding, metal shingles, and steel ceilings.

Since that time new branches, offices and production facilities were constantly added. So great was the variety of additional products that the old name no longer told the story. The name of the firm was changed to Milcor Steel Company on July 1, 1930.

With the acquisition of new plants and warehouses, the distribution of Milcor materials was extended throughout the entire country. Additional employees were required to take care of the demands for Milcor products, until the employees of the company and their families now number enough to form a fair-size community.



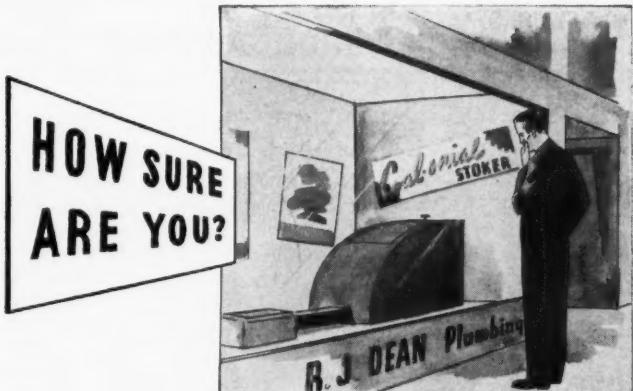
Louis Kuehn



Exhibit at the 1940 Detroit Builders' Show by Season-Aire Corporation of America, 20 Bartlett Avenue, Detroit, Michigan

Michigan Airtemp Distributors

The Airtemp Division of Chrysler Corp., Dayton, Ohio, has just completed a distributor set-up for the state of Michigan and has appointed Richards Manufacturing Company of Grand Rapids, Michigan, as the distributor for the western part of the state; Wm. A. Lange & Sons, Saginaw, Michigan, distributor for the eastern part of Michigan; Wholesale Lumber and Building Materials, Inc., distributor for the southern part of Michigan.



Ever stop to wonder about "the ones that are getting away?" About the sales and profits you are losing simply because you can deliver only one type of heating equipment? How sure are you that a great percentage of your possible heating profits are not going into another dealer's pocket? With the Conco line of "Automatic Packaged Heat" — coal, oil and gas-fired — you cover your market like a blanket. You're a "triple threat" dealer with classiest line of the decade . . . modern, streamlined, finished in brilliant "Hammerloid" . . . as mechanically perfect as engineering skill can make it. Write or wire today for the facts on Conco.



CONCO CORPORATION

Automatic Packaged Heat
DIVISION OF H. D. CONKEY & CO.
22 AUTO AVENUE .. MENDOTA, ILL.

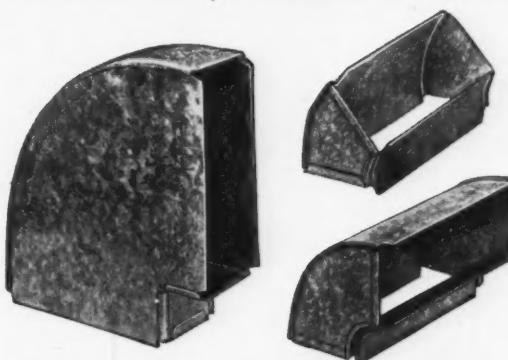
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AJAX

A NEW LINE OF PREFABRICATED DUCTS and FITTINGS

for Forced Air and Air Conditioning Installations



Our Catalog "A" (Gravity Fittings), Catalog "B" (Forced Air Fittings) are yours on request.

THE CINCINNATI SHEET METAL & ROOFING CO.

Furnace Fitting Department

230 E. Front St.

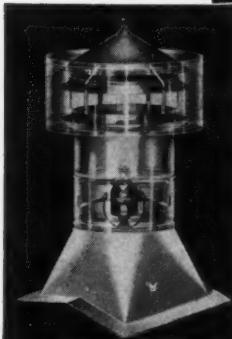
Cincinnati, Ohio

YOU CAN GET THE JOB WITH

BURT VENTILATORS

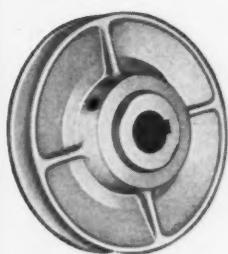
Every advantage is yours when you sell the complete Burt line of roof ventilators. You have the variety, the quality, and the prices all to back you up. On either public or private work you can meet every specification with favorable prices and make a profit. Burt Ventilators have superior features that get the business. Don't hesitate to let Burt Engineers help you estimate and lay out plans.

Send for catalogs.



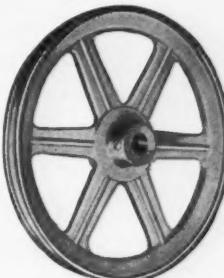
THE BURT MFG. CO.
Roof Ventilators • Oil Filters • Exhaust Heads
301 Main Street, Akron, Ohio

Dependable PULLEYS and COUPLINGS



CENTRAL Pulleys are designed and made by engineers of 20 years' experience in making quality pulleys. CENTRAL pulleys have an enviable reputation for sturdy dependability and long lasting performance under the service test of daily use.

CENTRAL Pulleys give quiet, trouble-free service on stokers, fans, air conditioning units, ventilators, blowers and refrigeration units. Write for catalog data book No. 108 and prices.



CENTRAL
DIE CASTING AND MFG. CO.

2935 WEST 47TH STREET

Chicago, Illinois

LET US HELP YOU GET YOUR SHARE OF FAN & BLOWER INSTALLATIONS

We
Know
How!

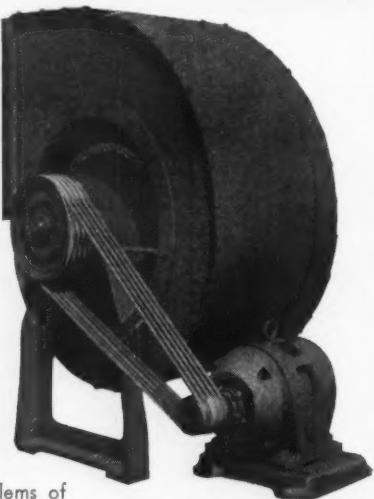
... Over 60
Years' Experience
(1879—1940)

You can earn big profits in all kinds of processing, industrial and manufacturing plants by solving problems of exhausting, collecting, drying, conveying, heat circulation, etc.

We can help you get this business. Our experience has brought us in contact with practically every known industrial requirement and much valuable information is available that means extra profits for you.

Canvass your City—consult us on problems—and make 1940 a year of better business.

Complete catalog file on application. Write for it today.



GARDEN CITY FAN CO., Mfrs.
332 So. Michigan Ave. Chicago, Ill.
New York Philadelphia Detroit Milwaukee Cincinnati

**NIAGARA
GAS FURNACES
ARE A. G. A. APPROVED**



GAS FURNACES... Copper Chrome cast iron; or... Toncan iron heat exchangers... selection of belt or direct drive blowers with two-speed control... summer-winter switch... modern casing design... concealed controls... high efficiency... low prices... A.G.A. approved.

Also coal and oil-fired furnaces.

THE FOREST CITY FOUNDRIES CO.
2500 W. 27TH ST. CLEVELAND, OHIO
ESTABLISHED 1890

ATTRACTIVE TERRITORIES ARE OPEN FOR
ESTABLISHED DEALERS • WRITE FOR DETAILS

With the Manufacturers . . .

D. K. Swartwout, Founder of The Swartwout Co., Cleveland, Dies

Denton K. Swartwout, 78, chairman of the board of the Swartwout Co., manufacturers of industrial ventilating and power plant equipment, died suddenly March 22 of a heart attack at his home, 2661 North Moreland Boulevard, Shaker Heights. He had been in ill health several years.

Mr. Swartwout founded the company about 1901 and was its president until four years ago. He was succeeded in the presidency by his son, Denton K., Jr.

Lockformer Trebles Floor Space

The Lockformer Company, Chicago, makers of Pittsburgh lock machinery, has completed arrangements to move its plant and offices to new quarters at 4615-17 Arlington St. In addition to improved lighting and other manufacturing advantages, the new plant affords more than treble the floor space.

Harold Flagler, president, believes that this arrangement will facilitate speeding up production to keep pace with the increased manufacturing schedule set for 1940.

Potts Joins Winkler Stoker Organization

Claude A. Potts, owner and operator of the Stokol-Indiana Company, located at 819 Massachusetts Avenue, Indianapolis, since 1933, distributing Stokol stokers and allied products for Schwitzer-Cummins Company, has discontinued his business and is joining the U. S. Machine Corporation of Lebanon, Indiana, manufacturers of Winkler stokers, in the capacity of Vice-President in charge of Sales Administration.

Mr. Potts was assistant purchasing agent at Purdue University for five years prior to going in the stoker business.

Green Foundry & Furnace Schools

Starting April 1st and continuing for 6 weeks, service schools for Green Colonial dealers will be held at Des Moines, Iowa, by the Green Foundry and Furnace Works. Each school will last 3 days, and will include instruction on the installation and service of automatic heating equipment for all fuels. Actual work in the company's laboratory will permit the dealers to solve wiring and trouble-shooting problems.

The schools are being held for the second consecutive year. They are under the supervision of George Zimbleman, manager of Green Colonial's automatic equipment division, assisted by Art Walters, chief engineer, and W. J. Hennessy, personnel director.

Reservations made for the schools indicate a representative attendance from all parts of the 300-mile-radius-territory served by the Green Foundry and Furnace Works from Des Moines.

Chandler Purchases Autocrat

Chandler Company, Cedar Rapids, Iowa, announces the purchase of the business, assets and manufacturing rights of the Autocrat Oil Burner Corporation, also a Cedar Rapids concern.

The complete engineering, manufacturing and sales facilities of the two industries are now joined in one automatic heating equipment division of the Chandler Company. Manufacture and sale of Autocrat oil burners will continue under the trade name of "Autocrat" and all operations are consolidated in the Chandler Company plant in Cedar Rapids.

Halford T. Barry, secretary and general manager of Chandler Company, announces that C. L. Fontana, president and general manager of Autocrat, will serve as sales manager of the automatic heating division in charge of oil burner and furnace unit sales.

Chandler Company manufactures gravity and forced air cast iron and steel furnaces, the nationally distributed Chamberlain Automatic Humidifier, and a complete line of pre-fabricated duct work.



THIS VERSATILE CONTROL GIVES YOU EVERYTHING YOU NEED FOR SAFE, ACCURATE AND AUTOMATIC CONTROL OF FLOOR FURNACES, SPACE HEATERS, ETC.

ALL GAS—NO ELECTRICITY NEEDED

Here is the most popular gas heating package set General Controls has ever developed. It includes the new, economical, noiseless B60-6 gas valve, automatic flame-failure pilot generator, and an attractive, sensitive T-80-3

thermostat, which can be used as remote or integral for floor furnaces, space heaters. Similar sets are available for wall and radiant heaters and gas fired steam radiators, and also for use with butane gas. Write today for your new copy of the 1940 General Controls Catalog. It's absolutely free.

NEW 1940 CATALOG NOW READY—REQUEST YOUR COPY

GENERAL CONTROLS
450 EAST OHIO STREET
CHICAGO, ILL.



267 FIFTH AVENUE
NEW YORK CITY

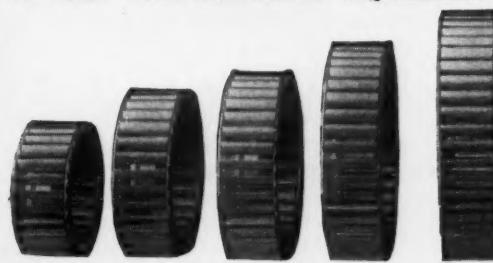


**Janette
Blower Wheels**

WHEELS for EVERY APPLICATION

**A COMPLETE RANGE OF SIZES
5" x 1" TO 12" x 12"**

TO MEET YOUR INDIVIDUAL REQUIREMENTS



The design and construction of a Janette lightweight steel wheel are so unique they are protected by patents. There is no other wheel like it. The scientifically curved blades deliver a maximum volume of air at a minimum of noise. Because of its special construction, a Janette wheel can stand exceptionally rough handling or hard service.

MAY WE SEND DATA AND PRICES

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Quiet as a
Randall
PILLOW BLOCK!

Almost a million Randall Pillow Blocks of all types are operating quietly and efficiently in the field. Their sturdiness and dependability have earned them a preference by the majority of manufacturers of air conditioning equipment. A larger One-Piece Steel Housing Pillow Block for shafts of $1\frac{1}{16}$ " to $1\frac{5}{8}$ " diameters has been added to the line. Send for catalog showing a Randall for every pillow block need.

**SELF-LUBRICATING
SELF-ALIGNING
ECONOMICAL
DURABLE**



**RANDALL GRAPHITE PRODUCTS CORP.
DEPT. 411, 609 W. LAKE ST., CHICAGO, ILL.**

**PERFORATED
METALS**

Every Sheet Metal Worker needs perforated metal in one form or another.

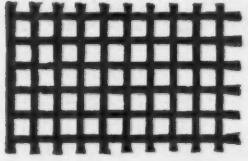
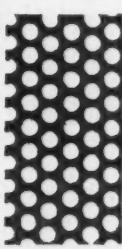
For processing food products and to withstand certain chemicals, perforated Stainless Steel and Monel Metal are much used.

Factory Safety Guards—For this service perforated metal has no equal.

For Grilles, Radiator Enclosures, Air Conditioning Cabinets, we have many beautiful designs. Write today for information and prices.

You'll like H&K prompt,
satisfying work and
pleasing prices.

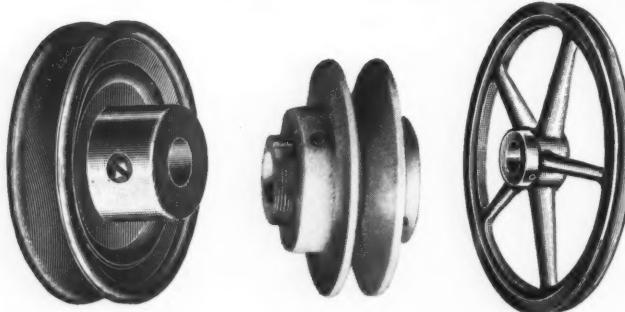
Perforators of metals since 1883.
Send us your specifications.



**The Harrington & King
PERFORATING
Co.**

5649 Fillmore St., Chicago, Ill. New York Office, 114 Liberty St.

Compare MAUREY V-PULLEYS With Any Other V-Pulleys Made



Then you will know why so many builders of Air Conditioning and Refrigeration Units, Blowers, Fans and Stokers find that MAUREY V-PULLEYS save them time and money.

MAUREY STEEL V-PULLEYS are designed and built to give maximum service. Made of heavy steel sections with hubs of machined steel . . . not die cast.

MAUREY VARIABLE PITCH PULLEYS of cast iron construction. Speed adjustment of as much as 30%. Fine, accurate, milled threads, 20 to the inch, assure close adjustment. Made in 4 sizes—3 1/4 to 4 1/2 inches. O. D. for Air Conditioning Units.

MAUREY CAST IRON PULLEYS are made on a new principle of design that permits freer flow of air through spokes. They are balanced and true running and much sturdier than pulleys of the usual design.

WRITE FOR CIRCULARS AND PRICES

MAUREY MANUFACTURING CORP.
Wabash at 29th, Chicago, Illinois

FOR SUMMER PROFITS *Sell Comfort Cooling*

**EVAPORATIVE COOLING,
LOWEST IN ALL COSTS, IS
SWEEPING THE COUNTRY**

**Kooler-aire
PACKAGE UNITS**
COOL, CLEAN, WASH,
FILTER AIR IN STORES,
TAVERNS, SHOPS, BEAUTY PARLORS, OFFICES, HOMES

CAPACITIES 2500 to 10,000
C. F. M.

You can make money bringing Kooler-aire comfort cooling to the average business and home. Kooler-aire is low cost cooling. Easy to install, inexpensive to operate. Delivers big value. Write for complete details. USAIRCO shows you how to sell and install comfort cooling. Complete merchandising helps.



Write for special data
on wheels, housings and
light duty assemblies.



UNITED STATES AIR CONDITIONING CORP.
NORTHWEST TERMINAL
MINNEAPOLIS, MINNESOTA, U. S. A.

New Literature . . .

For your convenience in obtaining copies of new Literature use the coupon on page 118.

124—Industrial Air Filters

Air-Maze Corporation, 5200 Harvard Avenue, Cleveland, is distributing a 4-page folder entitled Multimaze industrial air filters for blowers and air conditioning systems as well as other fields of application. Specifications are included.

125—Capacitor Motors—GEA-2915A

General Electric Co., 1 River Road, Schenectady, N. Y., is distributing an 8-page folder—GEA-2915A—covering their general-purpose capacitor motors (Type KC $\frac{1}{8}$ to $\frac{3}{4}$ hp), their applications, construction, characteristics, modifications, ratings and advantages.

126—Oil Burner

The Rybolt Heater Company, Ashland, Ohio, is distributing a 4-page folder covering the Rybolt oil burner. Rybolt oil burner data and dimensions as well as specifications and capacities of the Rybolt series 4400 oil burning furnace are given.

127—Arcoflame Conversion Burners

American Radiator & Standard Sanitary Corporation, P. O. Box 1226, Pittsburgh, is distributing literature covering their Arcoflame conversion burners. Four features are mentioned—the Turbometer, Flame Stabilizer, Flo-stat and Arco-Mute tube.

128—Kitchen In-Built Ventilators

Victor Electric Products, Inc., 2950 Robertson Ave., Cincinnati, is distributing an 8-page catalog covering Victor In-Built ventilators for kitchens, etc., describing the various models, illustrating the various parts, and including specifications.

129—Nibbling Machine Work Sheet

The Andrew C. Campbell Division of American Chain & Cable Company, Inc., Bridgeport, Conn., is distributing Tip Sheet No. 5—a work sheet for all who sell Campbell nibbling machines. On the front side are first pictures and selling tips for the men who sell Campbell cutting machines.

130—G-C Controls

General Controls Co., 700 W. Ivy St., Glendale, California, is distributing a 44-page catalog dated March 15, 1940, illustrating and describing their various controls. Specifications are included and the book is indexed. The company maintains branches in Chicago, Cleveland, Detroit, Houston, Kansas City, Los Angeles, New York and San Francisco.

131—ABC of Spray Painting

The DeVilbiss Company, manufacturers of spray painting equipment, has just published a hand book—the A B C of Spray Painting Equipment.

The subjects treated are: the Paint Spray Gun, its troubles, remedies and accessories; Material Containers; Hose and Hose Connections; Air Transformers and Condensers, and Air Compressing Outfits.

The material in the book is presented in question and answer form. The questions are those most often asked at The DeVilbiss Training Schools and clinics. Effort was made in preparing the book to refrain from highly technical or involved terms. Added clarity is lent the text of the book by the frequent illustrations and diagrams.

Single copies may be obtained free or arrangements made for procuring copies in bulk.

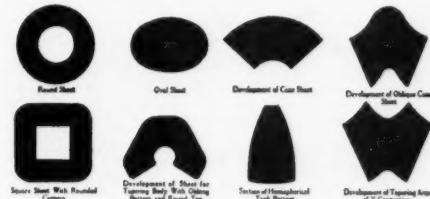
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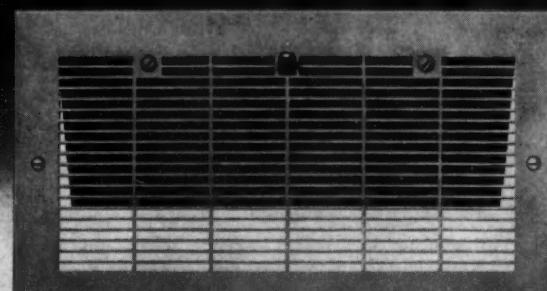
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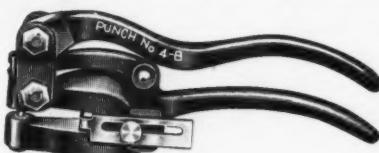
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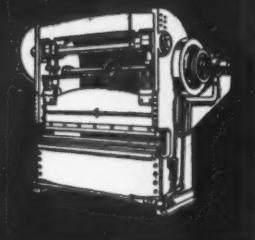
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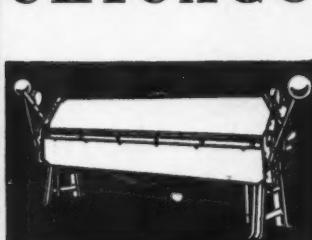
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New Literature

For your convenience in obtaining copies of new Literature use the coupon on page 118.

132—Ace Spot Welders

Pier Equipment Manufacturing Co., Milton & Cross Sts., Benton Harbor, Mich., is distributing Catalog 40, illustrating and describing the complete line of Ace Spot Welders. The newly designed contactor and the latest operating mechanism used on the 1940 Manually-operated welders are explained. A discussion on the choice of manual and automatic types is included.

133—Automatic Oilfurnace

Timken Silent Automatic Division of the Timken-Detroit Axle Co., 100 Clark Ave., Detroit, is distributing a catalog page covering the Timken Model FER-65 automatic Oilfurnace, an air conditioning oilfurnace for the small home, completely assembled at the factory, and fired by the Timken Wall-Flame oil burner.

Features, dimensions, specifications and performance data are given.

134—Modern Time Switches

Sangamo Electric Company, Springfield, Illinois, is distributing Catalog No. 1000, featuring the complete line of Sangamo time switches.

The catalog contains a detailed description of the synchronous motor, synchronous motor with carryover, and electrically wound time-switches, in conventional and socket type enclosing cases. Complete A.C. and D.C. ratings with contact specifications are also listed, as are astronomic dial, two-circuit, duplex, and outdoor time-switches. The booklet includes full information about the wide variety of control features, such as omitting device, advance time-cutoff and others, available in the various forms of Sangamo Time-Switches.

135—1940 Portable Electric Tools

The Black & Decker Mfg. Co., Towson, Maryland, has just issued its 1940 catalog covering the complete line of portable electric tools, including the improved $\frac{1}{4}$ in. Junior and the $\frac{1}{2}$ in. Junior, with "Pistol Grip and Trigger Switch."

136—Metalwork—Adam and Evans

Longmans-Green & Company, Inc., 114 Fifth Avenue, New York City, offers "Metalwork" (3rd Edition) by Hugh M. Adam and James H. Evans, published late in 1939 by Butler & Tanner, Ltd., Fromme and London. Price \$3.00.

The book is intended as an assistance to teachers wishing to introduce metalwork into the practical subjects.

Part I covers metals used in the craft room; with chapters on Notes on School Metalwork; History of Metals; the Metallic Ores; Manufacture of Pig Iron; Wrought Iron; Mild Steel; Cast, Electric and Alloy Steels; the Non-Ferrous Metals and Their Manufacture; Alloys, Workshop Uses, Properties and Characteristics of the Common Metals; and the Distribution of Metal Production.

Part II covers tools and processes; Vises; Files, Filing and Scraping; Measuring, Testing and Marking Out Tools; Hand Tools; Sheet Metal Work, Soldering and Brazing; Forge Work; Drilling, Shaping, Riveting, Punching, Shearing and Grinding; Lathes and Lathe Work; Copper Working; Casting; Etching, Repoussé Work, Engraving, Enameling, Plating, Bronzing, Coloring, and Lacquering; Speeds, Feeds and Power Required for Machine Tools, Shafts, etc.; Standard Threads, Bolts, Gauges, Sizes and Properties of Material; Motive Power—Steam Engines, Gas, and other Engines, and Electric Motors.

There is a Glossary, Examination Questions and an Index. The Frontispiece is a colored steel tempering diagram.

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WHITNEY-JENSEN METAL
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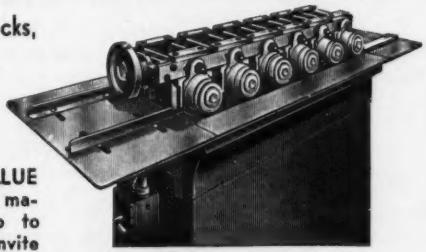
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FREE: Complete, easily understood short method for figuring air conditioning job. You can complete your figures, price job in one hour flat. Write Dept. No. 2. The Williamson Heater Company, Cincinnati, Ohio.

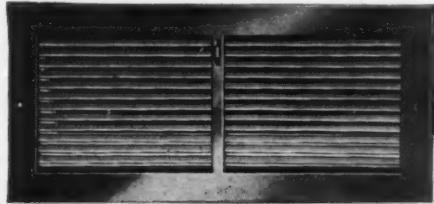
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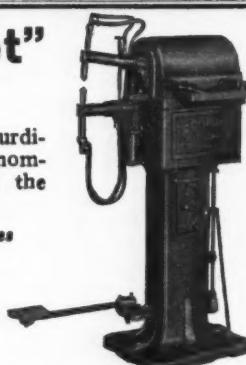
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New Literature

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137—Where to Find Trade Names

Alice M. Amoss, Librarian, Technical Library, Edgewood Arsenal, Maryland, has published a bibliography of trade names.

138—Congress Drives Catalog 140

Congress Tool and Die Division, 3750 East Outer Drive, Detroit, is distributing Catalog No. 140 with revised prices and full information about the Congress line.

139—Motor Driven Time Delay Relay

The R. W. Cramer Company, Inc., Centerbrook, Conn., is distributing Bulletin F-2 covering their new Synchronous motor driven time delay relay.

140—Oil-Fired A. C. Furnaces

Evanair Division of Evans Products Company, Detroit, is distributing a 4-page folder illustrating and describing the Evanair oil-fired air conditioning furnaces—Models 0-551, 0-801 and 0-1001, with 55,000 to 100,000 Btu output.

141—Bigger Profits from Better Signs

The American Rolling Mill Co., Middletown, Ohio, is distributing a book especially for the sign industry, with detailed fabricating and selling information on Armco special-quality sign metals—stainless steel, Paintgrip, enameled iron and others.

142—The Story of Insulation Board

Insulation Board Institute, 111 W. Washington St., Chicago, is distributing a 36-page book entitled "The Story of Insulation Board," the characteristic of which is strength with heat and sound insulating properties. The nominal conductivity is 0.33 and the tensile strength averages 175 pounds per square inch.

143—Model House Attic Fan Demonstrator

The Lau Blower Company, 2001 Home Avenue, Dayton, offers for demonstration in the dealer's display room or in the prospect's home a model house with miniature Niteair attic fan, at below actual cost of manufacture.

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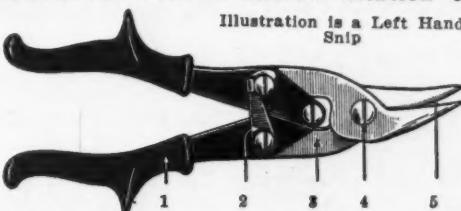
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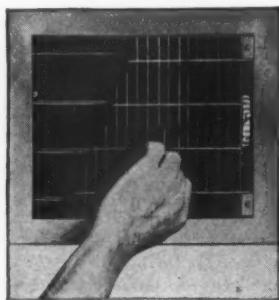
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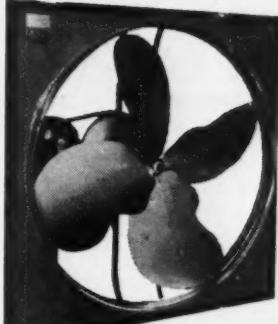
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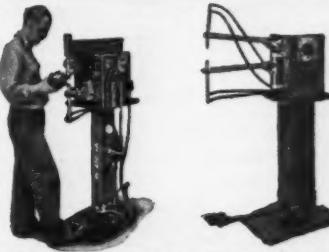


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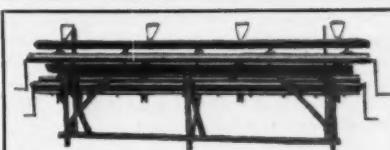
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4644 W. Huron St., Chicago, Ill.



Electric welding equipment of every description to weld from a watch case to a door. Special or standard SPOT WELDERS from $\frac{1}{4}$ to 500 K.V.A. A.C. Arc Welders from 100 to 400 Amps. We invite contract Spot Welding in large or small quantities.

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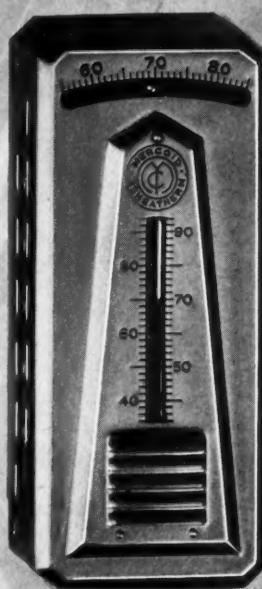
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IT PAYS TO SELECT WISELY WHEN BUYING AUTOMATIC CONTROLS

THE NAME
MERCOID

is an assurance of the highest
quality in Automatic Controls



Merco^{id} Sensatherm

This instrument leads in the qualities that distinguish a fine room thermostat. It is unique in both construction and operation, and noteworthy for its outstanding record of performance. ¶ There are basic reasons for its extreme sensitivity to temperature changes. Because very little energy is required to open or close the circuit, it maintains an even room temperature without the use of heater coils or other means of artificial acceleration. In this respect, the Mercoid Sensatherm is a true thermostat. It eliminates the objection of having too frequent operations of the heating equipment. ¶ The Sensatherm has an ingenious mercury switch that remains in a stationary position. Within the switch, is a movable electrode that is actuated by means of a small permanent magnet fastened to the free end of a bi-metal coil, which moves in a back and forward direction according to temperature changes. The switch is hermetically sealed and functions under all operating conditions over a period of many years without deterioration. ¶ Apart from the dependable performance of the Mercoid Sensatherm, it is small in size and neat in appearance. The soft champagne tone Alumilite finish will harmonize with any type of interior decoration. The finish is easily kept clean by simply using a soft dust cloth. It retains its lustrous beauty indefinitely. ¶ See catalog for complete information.

★ ★ ★ ★ ★ ★ ★ ★

Mercoid Warm Air Limit or Fan Control



The Fan or Limit Control are identical in construction and operation. The only difference is that the mercury switches are respectively placed in a reverse position. The Limit Control, Type M-51 is used to prevent overheating warm air furnaces that are automatically fired or where the furnace is regulated by a damper motor.

¶ The Fan Control, Type M-53 is used on blowers or booster fans to accelerate the heating of one or more rooms. It prevents blowing cold air into the rooms if the furnace is not hot enough to deliver heat. This control is furnished standard with a summer switch for ventilating purposes.

Mercoid Combination Fan and Limit Control



This instrument combines both controls in one case, having all the desirable features in common. A simple double adjustment is provided for setting the high and low operating points. The range can be adjusted over the entire scale and the differential can be set for very close operation or it may be widened to meet

field requirements. The range is indicated on a visible dial and a pointer also indicates the temperature in the furnace hood. It is provided with an adjustable flange to permit correct mounting on any angle between 30 and 90 degrees. The simple two wire hook-up facilitates easy installation.

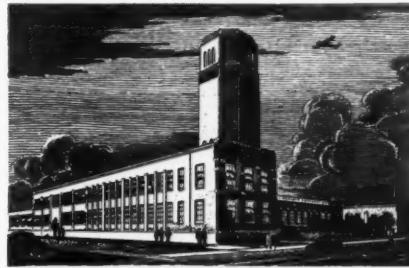
MERCOID SWITCHES USED EXCLUSIVELY IN ALL MERCOID CONTROLS

Mercury switches are ideal for automatic control applications. They eliminate all contact trouble. Mercury switches cannot be affected by dust, dirt or corrosion. There is no



open arcing. The contacting surfaces are not subject to pitting or sticking. They remain permanently clean. The switch shown is the type used in the Limit and Fan Controls.

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Principal Cities
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Main Office and Factory
4207 Belmont Avenue
Chicago, Illinois

THE MERCOID CORPORATION



ASSURE ABSOLUTE SAFETY
 BECAUSE
Hydraulic Action
LIMIT CONTROLS
OPERATE ON POSITIVE HYDRAULIC PRINCIPLE

A warm air or hot water limit control may be called on to shut down the heating system tomorrow or in ten years. To provide adequate protection to the home owner that control must be sure to operate any time at the temperature originally set on the control scale.

Because White-Rodgers Warm Air and Hot Water Safety Limit Controls function on the positive principle of Hydraulic Action they will always operate at the temperatures specified on their calibrated dials. Freedom from operating temperature "drift" is but one of the inherent characteristics of the Hydraulic System of Control.

You can now assure your customers of real protection when you use White-Rodgers Hydraulic Action Controls. Complete data on these safety limit controls is available. Write for it today.

WHITE-RODGERS ELECTRIC CO.

Controls for Heating • Refrigeration • Air Conditioning

**1215 CASS AVE.
 ST. LOUIS, MO.**